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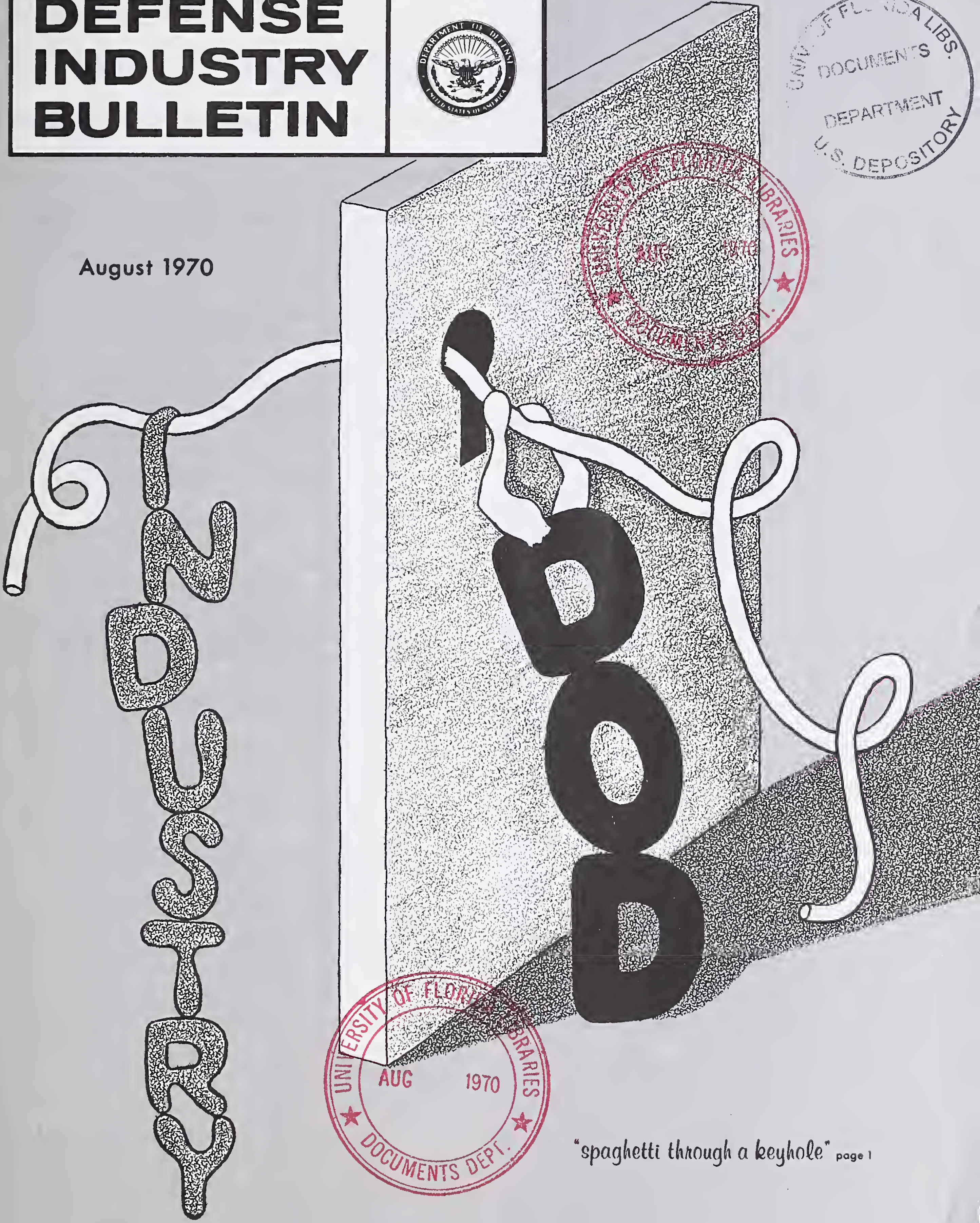

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"spaghetti through a keyhole" page 1

DEFENSE INDUSTRY BULLETIN

Vol. 6 No. 8 **August 1970**

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HON. MELVIN R. LAIRD
SECRETARY OF DEFENSE

LT. GEN. EARL C. HEDLUND, USAF
DIRECTOR, DEFENSE SUPPLY AGENCY

EUGENE F. HART
SPECIAL ASSISTANT, PUBLIC AFFAIRS

ACTING EDITOR
CAPT. FRANK W. KAFER, USAF

EXECUTIVE EDITOR
MRS. CECILIA POLLOK McCORMICK

ART DIRECTOR
R. FRED WIGHTMAN

EDITORIAL, CIRCULATION ASSISTANT
JO2 CHARLES D. WITTMAN, USN

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The *Bulletin* serves as a means of communication between the Department of Defense, its authorized agencies, defense contractors and other business interests. It provides guidance to industry concerning official DOD policies, programs and projects and seeks to stimulate thought on the part of the Defense-Industry team in solving problems allied to the defense effort.

Suggestions from industry representatives concerning possible topics for future issues are welcome and should be forwarded to the Editor at the address shown below.

The *Bulletin* is distributed free of charge to qualified representatives of industry and of the Departments of Defense, Army, Navy, and Air Force. Subscription requests should be submitted on company letterhead, must indicate the title of the requester, and be addressed to: Editor, Defense Industry Bulletin, Hq., Defense Supply Agency, Alexandria, Va. 22314.

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Defense Technology: Benefits to Industrial Progress

Dr. Donald M. MacArthur

The mission of the Defense Department is to provide for the security of our country. To do this, the department must acquire new weapons and military systems, and develop and maintain a technological base on which these systems depend.

In performing this mission, there has been a "spin-off" of technical innovations, often overlooked, which have contributed immeasurably to the nation's industrial and economic growth. Jet engines, jet aircraft, radar, titanium, communication and navigation satellites are a few examples in which DOD has played a vital role.

We might ask whether these technological developments would not have happened anyway. The answer is yes. They probably would have been developed anyway, but much later. DOD had the first recognized need for them—a need which was strong enough to justify the expenditure required to develop them. Thus, they came into being much earlier than they would have otherwise, and so increased the pace of U. S. industrial progress and economic growth.

Special efforts are made to foster transfer of defense-related technological information to the private sector where there is a commonality of interest between DOD and other organizations, both governmental and private. Because these DOD activities do benefit the general economy, it would be useful to describe the policies of DOD in this area, the factors that influence DOD in making the innovation in the first place, and the processes by which the innovations and their associated technologies are transferred to other sectors of the economy. This is what I want to discuss in this article.

First, I want to be very clear on one point. The overriding contribution of the Defense Department to industrial welfare is the assurance of national security. Sometimes this is lost in our enthusiasm as we discuss spin-off contributions to the economy, but a strong and dependable national security underlies all of our economic growth.

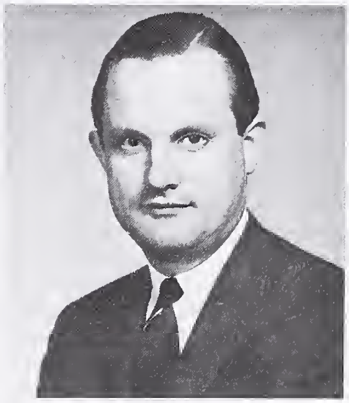
With regard to DOD relationships with the private sector, we do everything we can to foster the welfare of every segment of our society. To implement this, Secretary of Defense Melvin R. Laird established a high level council—the Domestic Action Council. This council has responsibility to find and implement ways in which the department can make even greater contributions to our pressing domestic problems. This was not a purely altruistic act on Secretary Laird's part. There were two reasons for his action.

First, it is evident that our defense capability and our national security rest fully as much on the strength and solidarity of our society at home as they do on our military forces and the systems they operate, either for deterrence or defense. Second, it is equally clear that demands on our national resources are growing rapidly, and we must secure the maximum benefit to all sectors of the United States from every investment made and from every resource that can be applied.

There is one caveat, however. Each program, which may alleviate some domestic problem, must also be of direct benefit to DOD. We would not request, nor would Congress appropriate, DOD funds for purposes not directly associated with the DOD mission of national defense. In fact, DOD has long standing policies that require all research and development programs to be relevant to military service mission requirements. Congress recently reemphasized this restraint in the FY 1970 Defense Appropriation Act. Title II, Section 203, of this act states that none of the funds authorized "may be used to carry out any research project or study unless such project or study has a direct and apparent relationship to a specific military function or operation." But there are many occasions when problems of DOD are also confronted by other organizations, both public and private. Clearly, we can increase our return on the investment of public funds, if we are aware of these needs and transfer our innovations to those who can use them.

Two examples of current projects illustrate this. One is concerned with housing, the other with hospitals.

DOD provides housing for many



Dr. Donald M. MacArthur is Deputy Director (Research and Technology), Office of Director of Defense Research and Engineering. The programs he directs cover rocket and missile propulsion, materials technology, medical, life, social behavioral and environmental sciences, and chemical technology. Dr. MacArthur holds a B.S. degree from St. Andrew University, Scotland, and a Ph. D. in X-ray crystallography from Edinburgh University, Scotland.

military personnel and their dependents. At the present time, DOD owns approximately 370,000 family dwellings, representing an acquisition cost of over $5 billion and a much larger replacement cost. DOD must maintain these units. It is necessary to build from 5 to 10 thousand new units annually to replace old dwellings. The current cost of new units is about $19,500 each. It is obvious that reductions in acquisition and maintenance costs of family units would save substantial sums for DOD.

About two years ago, we initiated a number of studies on housing construction methods that would reduce the overall costs by 15 to 20 percent. We are now starting construction of 200 family units at George AFB, Calif., to test the concepts and ideas generated by these studies. In particular, we will test the feasibility and economics of a mobile factory concept for housing construction. Needless to say, we have kept the Department of Housing and Urban Development fully informed of this work.

There are several reasons why DOD is in a good position to do this work. First, DOD's inventory of housing is large enough so that reduced costs through research and development would produce a big payoff. Second, DOD owns Federal property where demonstration units, like those at George AFB, can be built with somewhat greater flexibility because of the absence of traditional building codes and zoning laws. Finally, DOD has the technological capability to do the research and development work, and it has the administrative structure to accumulate comparative construction and operating costs, records of consumer acceptance, and other data over an extended period of time.

Another project, initiated by DOD, concerns the reduction of the rate of increase of hospital costs. DOD operates a very large health care program and owns 230 hospitals with annual operating costs of $1.8 billion. These costs, like those in the private sector, are increasing at an alarming rate. Two competing studies have been completed applying an overall systems analysis of our total military health care system. The concepts emerging from this systems approach will be incorporated in a "new generation" prototype hospital to be built in 1972. The Department of Health, Education and Welfare and the Veterans Administration have been participants in the design of the program and selection of contractors.

There are numerous other examples of efforts by DOD with other Federal agencies, such as the Departments of Justice and Transportation, and the Atomic Energy Commission. There are also numerous mechanisms to transfer DOD technology to industry. I will discuss these later.

Source of New Technology

Why is DOD such a major source of new technology?

I believe that there are two reasons for this. The first is urgency. Where there is solid information which indicates that a rival power is overtaking our military superiority in a particular field, then a sharp sense of urgency is felt. It leads to an immediate analysis of possible technological and operational responses, a driving urge to push available technologies to the limit, and the establishment of a strongly motivated organization to adapt and mesh the technological effort to the problem at hand.

The second reason for DOD's leading role is the scale usually demanded by the situation. This is also of special importance to the civilian economy, for it is one of the factors most responsible for transfer of DOD technology to industrial practice. For example, DOD needs for aluminum led the department to do much of the work which made possible the production and fabrication of this metal, and provided the basic engineering design data necessary for its use.

DOD also supplied the original market large enough for industry to achieve production economies so that aluminum now is found in countless consumer products. The same process has occurred at a different stage in titanium, and is presently happening with composite materials. American industry is now making a substantial investment in these new materials. And because industry is now devoting substantial resources to these materials, DOD can reduce its commitments and extend its efforts to newer technologies. In a very real sense, it is a "seed money" situation of profit to both parties.

Technology Transfers

The examples I used might give the impression that the process of technology transfer is easy. In actual fact, it is far from easy. Let me briefly explain why.

There are three categories of technology, and each differs in respect to its ease of transfer, the types of industry to which it can best be transferred, and the cost effective methods of transfer. The three categories are:

- Total systems (aircraft, radars, communication satellites).
- Components and materials (transistors, aluminum, composite materials).
- Techniques, processes and concepts (welding, explosive forming of metal parts, plasma plating, and systems analysis).

Transfers from the first two categories (total systems, and components and materials) are relatively straightforward and uncomplicated. Transfer from the third category is usually difficult, and depends very much on special skills and thorough understanding by the recipient.

Without going into detail, we have concluded that the limiting factor in transfer from the first two categories is largely economic. Industrial organizations which can adapt and use whole systems have highly capable research and development organizations. Companies which develop components and materials for DOD also serve the civilian market and they, too, are knowledgeable and competent. Both types are aware of new developments as they are occurring, and both frequently participate in the development.

I said that the limiting factor was economic. As an example, the transistor was an industrial invention. Its performance advantages over the vacuum tube were both highly attractive and immediately apparent. But it was also far more expensive—as much as 10 to 15 times. However, the military market, which placed a high value on performance, eventually demanded enough transistors so that mass production techniques were devised. Mass production lowered unit cost to the point that the transistor could be adopted by the home entertainment electronic industry.

The transfer of techniques, processes and concepts is very much more difficult. In addition to the economic aspects, the transfer is controlled to a great extent by the technical skill, conceptual ability, and creative drive of the potential recipient. Our experience has been that for three-fourths of the cases, in which a new manufacturing process was successfully transferred within the defense community, direct communication between people was necessary. Only in one-fourth of the cases could the transfer be made through written reports. I suspect that a similar ratio would be the case in the industrial community.

Why the Difficulty

There are three misconceptions which are widely held and, unfortunately, act as barriers to transfer of technology.

First, it is not true that *most* DOD technology is marketable by industry. Many times our requirements for high performance and reliability lead to high cost technology not compatible with the facts of the marketplace. However, if DOD requires the item in large numbers, then frequently industry will discover production economies which will make it, or some of its components, attractive for commercial exploitation. This was the case in the example of the transistor.

The second misconception, related to the first, is that DOD technology can be used directly for commercial purposes. This simply is not so. There is a cost of bringing new ideas to market—perhaps 80 to 90 percent of the whole innovative process. Production start-up, manufacturing, testing, licensing, and a myriad of other efforts are necessary.

Finally, there is the third myth that technology transfer can be fostered and increased by government efforts alone. That is like trying to push a piece of wet spaghetti through a keyhole. DOD can do the "push" part, but to get the job done there has to be a "pull" on the other end. That is what industry has to do if it wants to exploit defense technology.

How does DOD do its "push" part of technology transfer?

We publicize areas of procurement interest and contract awards. We foster the sharing of services and facilities (wind tunnels, accelerators, test equipment) which transfers technology and accomplishes face-to-face communication. We have a liberal and flexible patent policy. Finally, DOD has a strong technical information program designed to transfer technical reports within the Government and among defense contractors, as well as make maximum information available to the general public. During FY 1969, for example, approximately 1.9 million DOD technical reports were requested through the Defense Documentation Center and the Department of Commerce Clearinghouse for Technical and Scientific Information.

Changing Environment

These have been the patterns of the past. I fear they may not be adequate to the challenge of the future. There is nothing new in saying that the rate of change in the world is increasing very rapidly. It is true and it must be understood. The social and economic expectations of our people, and of people everywhere, grow and create insistent problems which must be solved. Populations grow and pose problems of hunger, disease and conflict. The pattern of industry changes. For example, we no longer gain our major economic growth from the extractive industries; and problems of industrial obsolescence and displacement arise.

Technology can help solve many of these problems—not all of them by any means, but a significant number. Our technological options and opportunities are increasing at an explosive rate, seemingly increasing the power of technology to contribute to human welfare.

However, there are strong counterforces as well. There are many people today who believe that technology creates as many problems as it solves, *e.g.*, pollution and the quality of our environment. They urge a halt to the proliferation of technology. Others believe that the time has come to divert funds from further technological progress to action programs aimed at alleviating many of our social problems. Others believe that technology is primarily responsible for escalation of the arms race. These criticisms, doubts and reservations are communicated to the Congress, and are being reflected in budget appropriations.

The result is that as our problems and our technological opportunities grow exponentially, support for technology relative to the opportunities it offers is decreasing. There was a time when we could fund all or most of the creditable and relevant technical ideas we had. We can no longer do this, and the resulting need to be selective can only increase. We are in a period when we must move from a strategy of parallel search to a strategy of selective choice, and be more conscious of the social implications of the product.

Whether we are technical managers in industry or in Government, we will have to manage technology better, and find ways to select the best from a large array of the good. How shall we choose, and by what criteria?

What is the marginal utility of that which we decide to discard, and of that to which we give support?

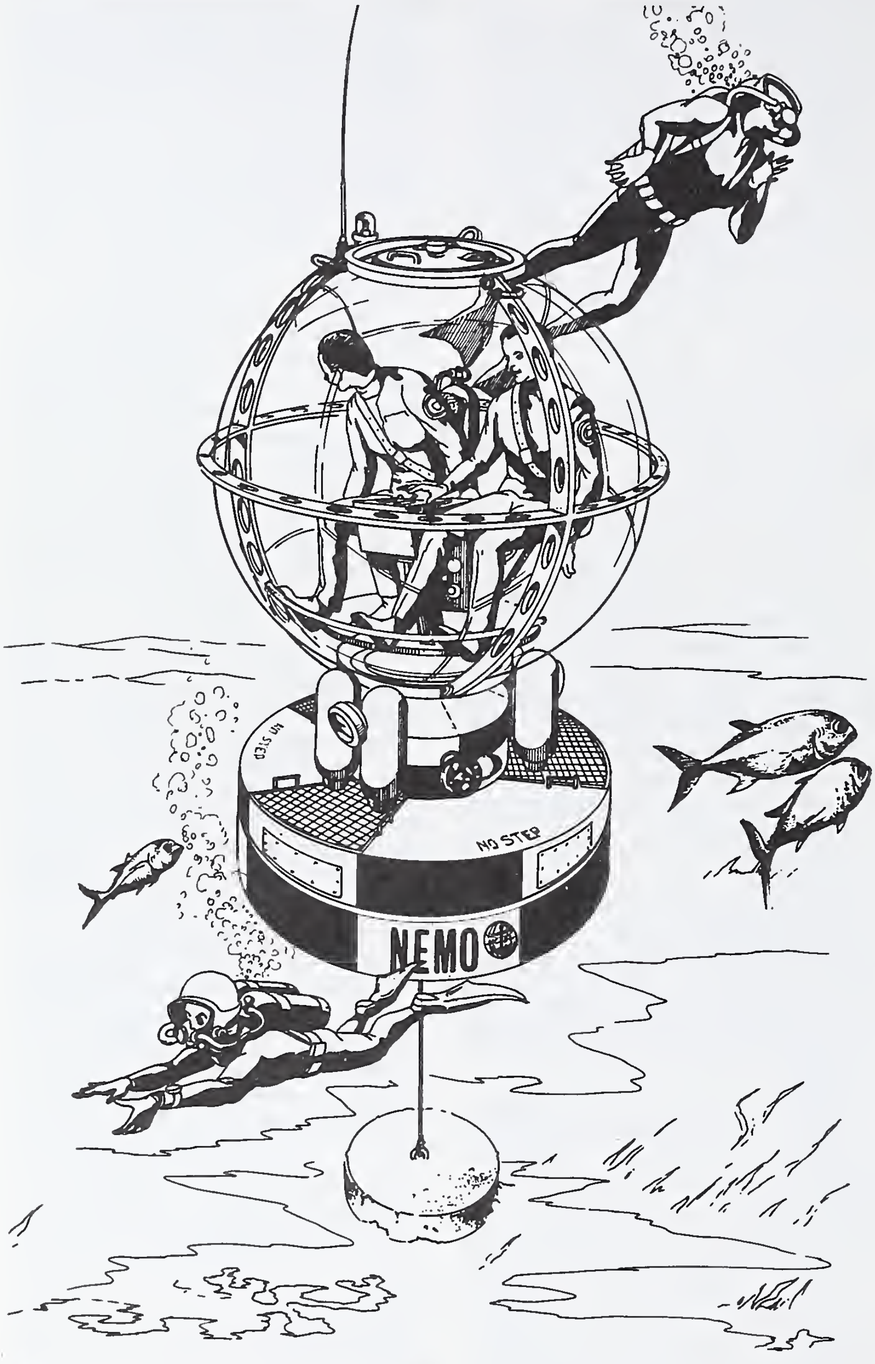
How can we avoid catastrophic error on the one hand and the safe, uninspired pedestrian approach on the other?

I am inclined to avoid any sweeping generalities—whether criticism or applause—about the interactions between defense research and development and industrial research and development. But on one generality I think we can agree. Modern business and modern government, like modern defense, depend upon a science-based technology to which all of us contribute and from which all benefit.

If we have learned anything from past attempts to exchange knowledge and to multiply the uses of new knowledge, it is that scientific and engineering professional communities of the nation can be indispensable "brokers" in the exchange process, in addition to providing high caliber technological leadership as they have in the past. Perhaps we should continue our effort working together in this area at all levels of government and all sizes of business. In addition, I think one of the most needed and rewarding tasks of the future will be to replicate, on the state and local government levels and through smaller businesses, the successes achieved in the past at the Federal level and through large businesses.

This is an area where large needs and great opportunities exist today. DOD will push—I hope you will pull.

Naval Civil Engineering Laboratory



Solving Problems On and Under the Oceans

Commander A. F. Dill, CEC, USNR

To conduct research and to develop, test, and evaluate techniques, equipment, material, and structures best suited for the construction, maintenance, and operation of facilities for advanced bases, amphibious forces, seafloor operations and the shore establishment. For 22 years the Naval Civil Engineering Laboratory (NCEL), Port Hueneme, Calif., has followed that precept in probing an assortment of problems confronted by fleet and shore establishments.

Under the Naval Materiel Command, the laboratory employs 360 people, including about 15 military, and operates under an $8 million budget.

A staff of 165 scientists and engineers includes civil, mechanical, electrical, hydraulic, electronics, chemical and structural engineers as well as chemists, marine biologists, metallurgists, physicists, mathematicians, geologists, and operations research analysts. Organization of NCEL is shown on page 7.

Private industry plays a role in NCEL's prime objectives. About 20 percent, or $1.6 million, of the laboratory's efforts are contracted with industry each year. Commercial firms also use some of NCEL's unique facilities for test programs.

Conversely, NCEL specialists are often summoned by outside sources, military and civilian, to investigate problems, and frequently offer on-the-spot solutions. What cannot be solved at the scene is returned to NCEL for more extensive research and development.

The laboratory's main efforts have been in the fields of ocean engineering, protective structures, high quality electrical power, waterfront structures and harbor facilities, deterioration control, soils and pavements, systems analysis, secure communication and Vietnam assistance.

NCEL's primary interest is the sea. With the accelerated interest in the oceans, the ocean engineering program has been expanded until approximately 40 percent of the laboratory's funds currently are allocated to ocean engineering projects. It is expected that the laboratory's industrial contracts may double in the near future, in keeping with increased growth of ocean engineering programs.

Briefly, NCEL's ocean engineering program supports the Navy's seafloor operations. The program includes research, development, test and evaluation in materials, equipment, construction techniques, and installations on the ocean floor. Other investigations involve the development of new and more effective equipment and procedures for salvage at sea.

The program involves specialists from many organization groups within the laboratory. There are about 40 engineers and scientists with varied ocean engineering experience. In addition, professional staff members from other departmental disciplines are called upon to assist with specific problems.

Among these is a prefabricated prototype storage or repair structure for use underwater at depths of 50 feet. The structure uses quick-connectors and specially fabricated panels developed at the laboratory. Called Divercon I, the project is part of an extensive program to develop adequate knowledge, techniques, systems, and equipment to support diver construction operations on the continental shelf. Divercon I places major emphasis on divers handling components on the seafloor without dependence upon the surface. It is a 10-foot diameter structure composed of three sections using large structure construction techniques. A variable-buoyancy float "sky hook" and a hydraulic winch are used for lifting operations, with divers controlling buoyancy of the float and operating the winch.

NCEL also is developing an underwater "pickup truck" called CAV (Construction Assistance Vehicle). The experimental diver-operated work vehicle, presently designed for a maximum depth of 120 feet, will transport divers, tools, power supplies, and equipment to ocean-bottom construction and salvage sites. The vehicle utilizes off-the-shelf hardware such as electro-hydraulic power packages, oil-immersed lead batteries, and hydraulic-motor-driven propulsion. Another underwater "vehicle" is NEMO (Naval Experimental Manned Observatory), a 66-inch-diameter acrylic plastic sphere. Developed jointly by NCEL and the Naval Missile Center, Point Mugu, Calif., NEMO will allow two observers to descend to an operational depth of 600 feet in a shirt-sleeve atmosphere, and enjoy panoramic visibility.

The evaluation of the sphere, made of 12 identical pentagons of acrylic, under simulated operational service marked the successul completion of the first phase in the development of spherical acrylic hulls for manned operations in hydrospace. NCEL used its six-foot-inner-diameter pressure vessel to subject the prototype NEMO hull to various test. The hull was tested for about 2,500 hours inside the vessel under varying pressures and water temperatures. Sea water was pumped into the vessel, adding to the oceanlike environment of test conditions. During that time, the acrylic hull withstood 335 hours of hydrostatic loading applied during 61 simulated dives at depths from 225 feet to 2,400 feet. Although the stainless steel hatch and bottom plate yielded somewhat during the simulated maximum depth dives, no visible damage was observed in the hull.

An extensive program to develop design guidelines for seafloor footing foundations has been furthered by development of the LOBSTER (Long-Term Ocean Bottom Settlement Test for Engineering Reasearch). The LOBSTER is a model footing capable of monitoring its own performance, designed for depths of 6,000 feet and deployments up to one year. The footing imposes a 100-pound per square foot load on soft sediments and, during emplacement, accumulates data on total and differential settlements.

A large, high pressure vessel (one of two on the West Coast) is part of NCEL's deep submergence simulation facility which provides the capability of simulating the hydrostatic loading conditions of any ocean depth with sea water. In addition to supporting work units from the Naval Facilities Engineering Command (NAVFAC), the facility is available to other government agencies and to industry. The laboratory can provide test facilities for private industry when they don't interfere with government-sponsored laboratory programs.

The facility consists of 22 pressure vessels, ranging from a five-inch (ID) 50,000 psi unit to the 72-inch vessel, with a working length of 120 inches and 5,500 psi. The laboratory has provided three basic types of testing capabilities: proof tests of equipment under external hydrostatic pressures as high as 20,000 psi; functional testing of electromechanical and electronic systems under pressure; and evaluation of electrical cables and connector systems under high pressures and in sea water.

Companies desiring use of the pressure vessels should contact Oceanographer Kenneth Gray of the Ocean Engineering Department. Charges for the 72-inch are approximately $600 per day, including the services of an oceanographer, two technicians and two riggers to handle heavy equipment. Charges for the smaller units are substantially less. The main criteria for use of the facilities is that the facilities are unique, hence not commercially available, and that the private tests do not interfere with government-sponsored laboratory programs.

Commander A. F. Dill, CEC USNR, is Commanding Officer of the Naval Civil Engineering Laboratory. Preceding his assignment to NCEL, he was assigned to the Defense Atomic Support Agency Test Command and detached to the Air Force Weapons Laboratory as Chief, Civil Engineering Branch. Commander Dill holds a bachelor of science degree from the U.S. Naval Academy, bachelor's and master's degrees in civil engineering from Rensselaer Polytechnic Institute, and a PhD. from the University of Illinois.

In 50 feet of water, DIVERCON is given initial tests. Part of an underwater construction program, it will eventually be tested to 600 feet.

At least a dozen commercial firms have used NCEL's pressure complex on an available time and space basis.

In the field of material corrosion studies, NCEL has been conducting evaluation programs in the ocean off Ventura County since 1961.

A series of eight Submersible Test Units (STUs) have been emplaced in the deep ocean. The latest one has been placed in 6,000 feet of water and will be brought to surface in December 1970.

More than 20,000 specimens of steel, woods, metal alloys, paints, ropes, plastics, and other materials have been tested. Approximately 12,000 of the specimens have been furnished by private industry. It is estimated that since the laboratory initiated its corrosion program, commercial companies have spent about $250,000 in services, costs and materials, taking advantage of this NCEL testing facility.

Information derived from STU served as guidelines to determine the best materials for the new Deep Submergence Rescue Vehicle (DSRV–I) in terms of preventing potential corrosion problems.

Industries interested in specimen testing on the STU can contact Metallurgist Fred Reinhart of the Civil Engineering Department for information on NCEL's material testing programs.

Through its Civil Engineering Department, NCEL investigates improved systems and techniques for conveying cargo during amphibious operations. One concept is the portable port which converts an unprotected beach into a berthing facility capable of handling most naval and commercial cargo ships. The system includes a T-shaped pier, breakwater, shore storage, fueling station and dock for unloading ammunition. A second concept consists of a straight pier attached to an adaptor ship. The port will be transported or towed to a beach site. After it fulfills its purpose, the port can be retrieved and stowed for future use.

Of special concern to NCEL in recent years has been its Vietnam Laboratory Assistance Program (VLAP). Engineers and scientists have gone to Vietnam to correct slick airfield surfaces, blowing dust, erosion problems, pollution of local water tables through poor sanitation, structural problems, corrosion, bridge sabotage and a host of other difficulties.

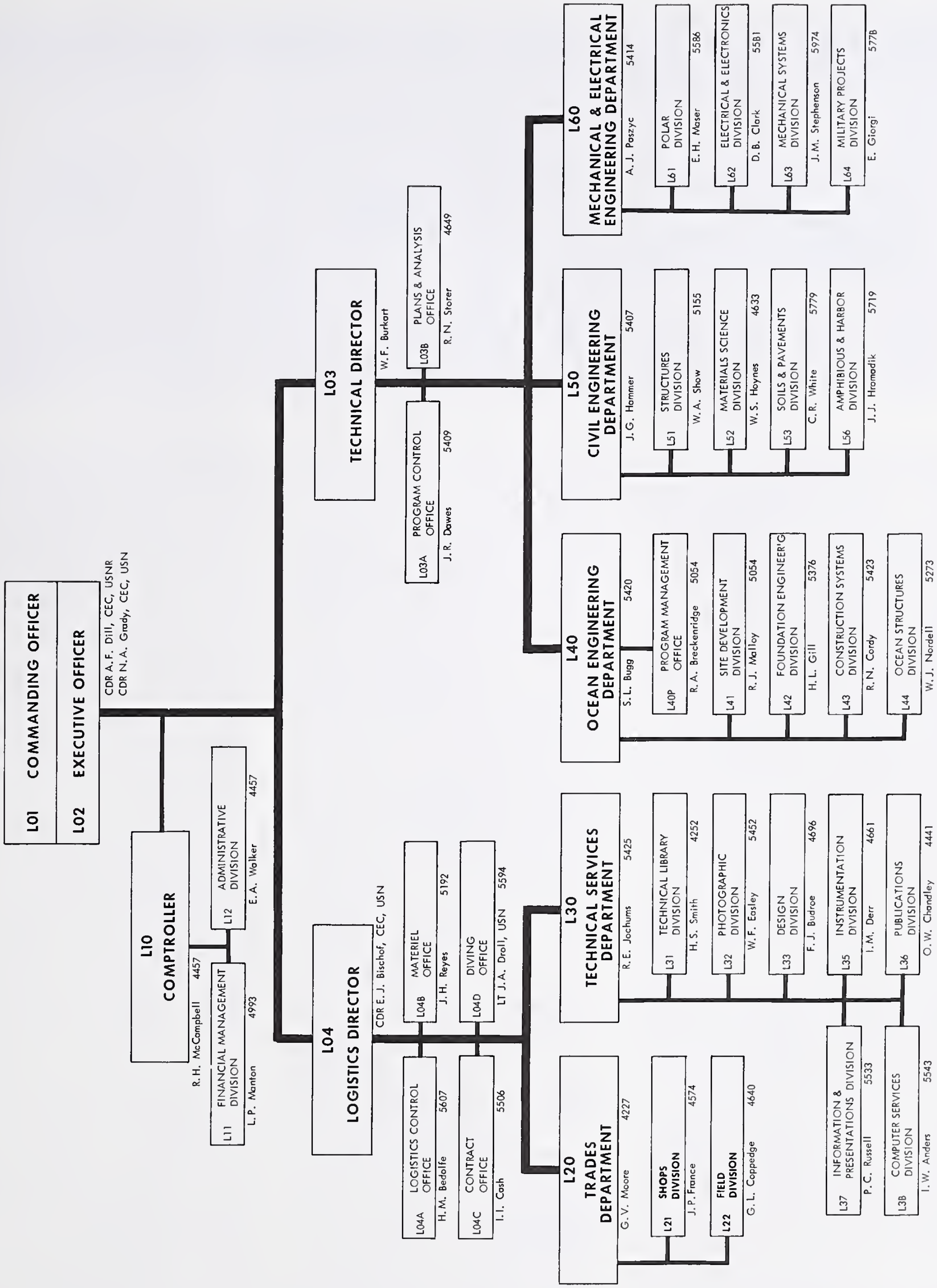
Many laboratory programs bear directly on the Seabee and the Mobile Construction Battalions (MCBs). For example, the laboratory has studied MCB hand tools to provide the least expensive, most durable and most useful tools in history. Some of the research, test and evaluation of hand tools underway at NCEL is the first of its type for hand tools.

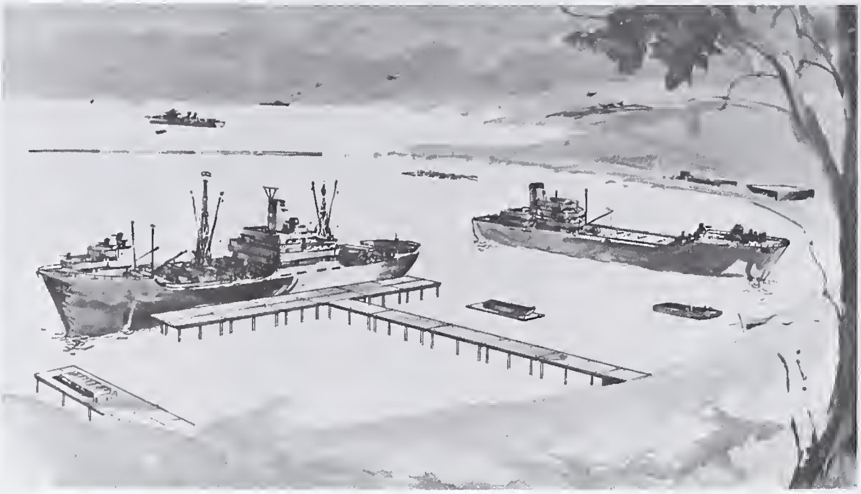
An active program in the development of high quality electric power is also underway at NCEL. Users of electrical power have found that their

NAVAL CIVIL ENGINEERING LABORATORY

Port Hueneme, California

Area Code 805, 982 + extension





Left: One of the new concepts of converting unprotected beaches to berthing facilities under study by NCEL.
Right: CAV, an underwater pickup truck, is designed for depths of up to 120 feet. It uses electro-hydraulic power packages, oil-immersed lead acid batteries and hydraulic motor-driven propulsion units.

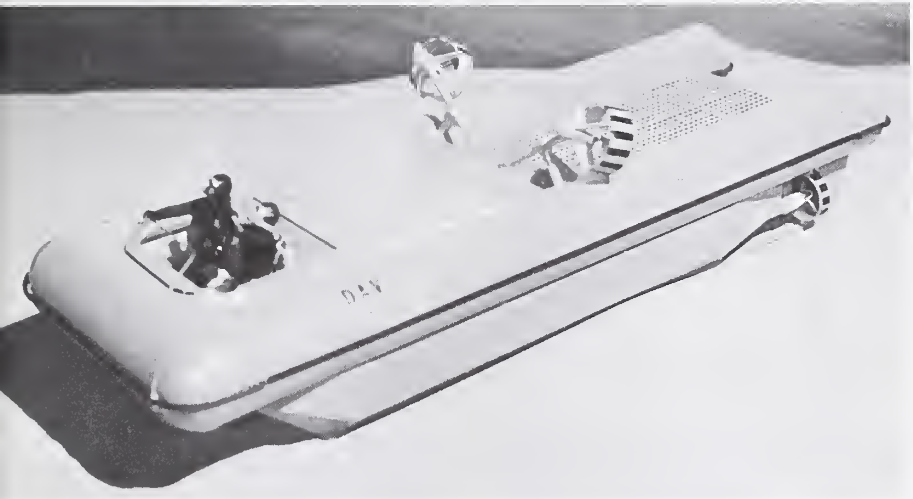
sensitive electronic equipment cannot tolerate milli-second power losses and minor voltage peaks and transients which rarely affect offices and homes.

Engineers at NCEL are investigating filters and auxiliary equipment which improve existing electrical power delivered to electronics equipment and which may help to eliminate many errors made by computers and cryptographic devices using conventional power sources. In addition, laboratory engineers have explored ways of modifying equipment instead of power sources, thus "desensitizing" the electronics equipment to many transients existing on today's conventional power sources.

As a part of the Joint Defense Communications Agency and Military Department Worldwide Electric Power Improvement Plan (1971–75), NCEL is monitoring power sources with power transient data acquisition monitors at Defense Department bases. Engineers from NCEL are also determining the transient sensitivities of operational electronic systems using a power transient synthesizer developed at the laboratory.

Other technical highlights in NCEL's efforts in FY 1970 include:

- Requirements for a prototype underwater laser surveying system were formulated jointly by NAVFAC and NCEL. The fabricated system is designed for use by scuba divers at depths of 60 feet. The laser instrument is a battery-powered, pulsed Argon gas unit mounted on a specially designed tripod with a leveling head. The system was first used in the Virgin Islands, surveying bottom sites for Project Tektite I.
- The laboratory participated in seven different projects during Operation Prairie Flat: a 500-ton TNT blast and shock experiment conducted at the Defence Research Establishment Suffield, Canada. It was designed to provide experimental data required for the solution of various nuclear effects problems. NCEL was involved in the testing of capsule-shaped structures and model silos.
- Two blast-closure valves developed at NCEL were proof tested during Operation Prairie Flat. A Breckenridge valve performed satisfactorily at overpressures of approximately 7 psi and 150 psi and was judged to be operational for future buried installations. The 10,000 cubic feet per minute blast valve, although not tested to full design capacity, also functioned satisfactorily. Further testing at higher overpressure levels was recommended.
- A 35-by-40 foot concrete funicular shell was tested under concentrated and uniformly distributed static loads. The laboratory's Structures Division found that such shells are remarkably strong and are expected to be useful in the Naval Shore Establishment and in civil construction wherever roof and floor elements are used. The shell was 2 inches thick with a maximum rise of 2.5 feet. It supported a uniformly distributed load of 135 pounds per square foot before local failure. Subsequently an undamaged portion of the shell was subjected to a concentrated load of 10,000 pounds before a punching failure occurred.
- Load curves were developed for the operation of C–121, C–124, C–140, C–141, and C–5 aircraft on the McMurdo, Antarctica, annual sea-ice sheet. The curves were based on elastic theory and the mechanical properties of ice sheets as determined by NCEL field and laboratory tests. The findings, comparing favorably with empirical data, are used by the Naval Support Forces, Antarctica, to develop sea-ice runways.
- Significant progress has been attained on two separate anchor programs. An exceptional type of propellant embedment anchor under development for the Supervisor of Salvage was field tested. Major goals are holding capacities up to 160,000 pounds and the ability to function in seafloor compositions of sand, mud, coral, and rock. A hard ocean bottom (rock or coral) presents the most severe marine salvage problem for conventional anchors. The new anchor demonstrated good potential, particularly in hard bottom sites. Successful embedment and a holding capacity of 168,000 pounds was achieved in rock.
- A unique vibratory anchor is being developed for NAVFAC to improve deep water mooring capabilities. Major goals include a 50,000 pound holding capacity and deployment at depths of 6,000 feet. Shallow water tests indicated holding capacities greater than 50,000 pounds.



In addition to cooperating with other Federal agencies in the development of its anchor projects, NCEL has gone to a number of private firms for valuable contributions. Major companies have been awarded contracts to design and fabricate anchor concepts. All told, approximately six industrial groups have been involved.

A unique cathodic protection system was developed to protect ground tackle (mooring chain) from corrosion. Protection was achieved in both muddy and sandy bottoms. An annual savings of about $1 million has been estimated within the naval shore establishment.

Other research underway at NCEL covers a wide spectrum of technical projects. The laboratory is working on the technology of wood deterioration control, concrete and cement materials, metal corrosion, protective coatings, plastics and related chemistry applications. Experts in soil mechanics perform project work in soil stabilization, earth dynamics, and the construction of runways, roads and foundations.

Once NCEL has solved a problem, it communicates findings to the working level through technical reports on finished projects, technical notes when milestone markers are attained, and technical data sheets, which condense pertinent information for wider dissemination. The laboratory also considers that personal contact is vitally important to the customers. Experts constantly tour field activities where they assist local personnel in applying lessons learned at NCEL.

From the Antarctica to the Arctic, and on and under the oceans between, NCEL is pursuing the Navy's civil engineering problems. A pursuit whose goal was stated by arctic explorer Rear Admiral Robert E. Perry, and has since been adopted as NCEL's motto: "I will find a way or make one."

NCEL Technical Reports

The following technical reports on work performed by NCEL are extracted from a bibliography compiled by the Defense Documentation Center. Space limitation in the *Bulletin* allows publishing only a partial listing. The reports listed and a complete bibliography may be obtained by registered organizations without charge from:

Defense Documentation Center
Cameron Station
Alexandria, Va. 22314

All organizations may purchase microfiche or full sized copies of these reports (65¢ and $3, respectively, prepaid) from:

Clearinghouse for Federal Scientific and Technical Information
Department of Commerce
Springfield, Va. 22151

All reports listed are unclassified.

Shock and Vibration Testing—Current Theory and Uncertainties. H. A. Gaberson, NCEL, March 1970, 53 p., AD-867 453L.

An Evaluation of Deep Ocean Research Vehicles. John B. Ciani, NCEL, Feb. 1970, 86 p., AD–865 362L.

Splash-Zone, Underwater-Curing, Epoxy Coatings. Richard W. Drisko, NCEL, Oct. 1969, 42 p., AD–863 030L.

Rigid Body Response of an Elastically Restrained Cylindrical Deep Ocean Structure to Detonation-Induced Underwater Shock. Harry S. Zwibel and John G. Hammer, NCEL, Nov. 1969, 31 p., AD–861 848L.

Corrosion of DSRV Materials in Sea Water—Six Months Exposure. Fred M. Reinhart, NCEL, July 1969, 31 p., AD–857 325.

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Glass Reinforced Polyester Coatings for Steel in Marine Atmosphere. Carl V. Brouillette, NCEL, Sept. 1968, 26 p., AD–843 139L.

Constant Back Pressure Receiver for Ocean Hydraulics. Dharam N. Pal, NCEL, June 1968, 34 p., AD–837 792.

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Test of Zinc Inorganic Coatings on Work Areas of a Floating Drydock—Results of 25-Month Inspection C. V. Brouillette, NCEL, May 1967, 23 p., AD–816 102L.

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Investigation of an Insulating Material for Deep Ocean Habitat Environments. S. C. Garg, NCEL, Sept. 1969, 27 p., AD–694 466.

NCEL Underwater Air Supply System. C. R. Hoffman and D. Pal, NCEL, May 1969, 43 p., AD–687 716.

Role of Value Engineering in the 1970s

Richard E. Biedenbender
Rudy H. Kempter

There are several ways of achieving specified levels of defense capability. One way is to invest more resources. However, most knowledgeable observers expect defense expenditures in the 1970s to decrease, at least in relative terms to the Gross National Product and expenditures for other national, social, and environmental needs.

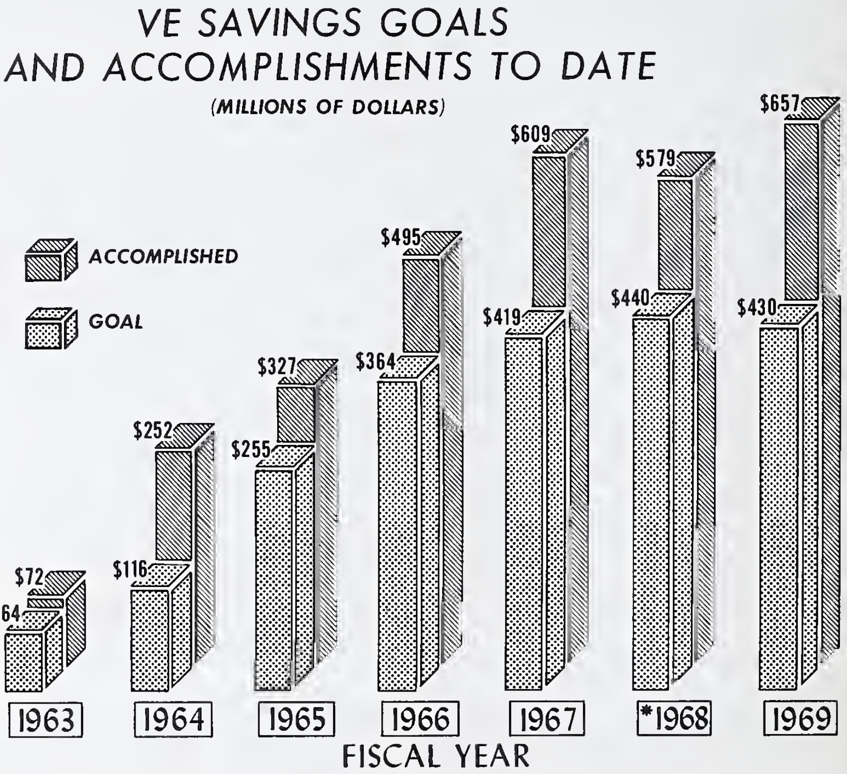
We must, therefore, look toward a second manner to provide the necessary military capability: more effective and efficient use of allocated defense resources. One approach to this objective is Value Engineering (VE). This article reviews the past and present of VE and current trends, and projects VE's role in defense economics of the 1970s. The discussion is based largely on the results of recently completed comprehensive top management review of the DOD Value Engineering Program.

Past and Present

VE began largely as a "grassroots" movement, initiated by engineers who recognized the need for a systematic approach for reducing the costs of products, both commercial and military.

While it has gained increasing recognition in both the Defense Department and industry in the past 15 years, today even its most avid disciples would concede that many VE programs are at best lip-service efforts maintained by management for "image" purposes. It has not yet gained full acceptance among management and line personnel as a methodology useful for attacking high cost areas. Its contractual provisions in the Armed Services Procurement Regulation (ASPR) are frequently ignored by contractors or circumvented by DOD program managers and contracting officers. It is widely regarded as an unwelcome and bothersome burden by overworked management, technical, and procurement personnel. Some people even regard it as an invidious scheme to unjustifiably enhance contractor profits. It would, therefore, seem to some that VE, like many managerial fads, is destined to fade away in the 1970s.

However, let's review progress. VE accomplishments are surprising in their productivity. Since FY 1963, almost $3 billion in audited VE savings have been reported in the DOD Cost Reduction Program. In terms of growth, in FY 1963 VE represented



*Cost reduction reporting system revised effective FY 1967 to report estimated savings for current fiscal year and up to two ensuing years from current year actions.

Figure 1.

about 10 percent of the Cost Reduction Program. It increased to about 25 percent in FY 1968. Figure 1 illustrates growth from FY 1963 to FY 1969. Most of these savings originated internally within the DOD.

Benefits which industry and DOD receive from industry VE activity can occur in four ways:

- Contractors use VE to lower initial bids. Savings of this type are, of course, impossible to measure.
- Contractors use VE to generate cost reduction changes which do not require a contract change. Although DOD does not benefit immediately in this case on fixed price contracts, this effort usually results in lower future contract prices. Contractors participating in the DOD Contractor Cost Reduction Program report about $200 million in such savings each year.
- Contractors generate savings under DOD-funded Value Engineering Program Requirement clauses. There are currently about 80 such funded program clauses in existence, generating about $150 million in savings each year. There will probably be more emphasis on the use of such program clauses in the future.
- Contractors generate savings under VE incentive clauses. These are savings frequently called Value Engineering Change Proposals (VECPs).

Since FY 1965, over 4,500 VECPs, worth an estimated one-quarter billion dollars to DOD, have been approved. The contractor has averaged about 25 cents in augmented income for each dollar saved during the sharing period. Over this period of time, the approval rate has varied between 50 and 60 percent. Perhaps even more important is the trend. Last year, estimated savings to DOD increased by 64 percent to over $84 million. The number of VECPs approved reached 1,221, the first year that more than 1,000 VECPs were approved. The number of hi-dollar (over $50,000) VECPs also increased. During the last fiscal year, for example, 19 approvals worth over $1 million were made. One of these was worth an estimated $22 million, with the contractor receiving an estimated $3.9 million as his share.

The record shows that contractors who have applied VE to their contract performance are reaping benefits. The DOD VECP report shows this record for five defense contractors over three fiscal years:

- In FY 1967, 38 VECP approvals resulted in savings of $5.65 million for the five contractors, $1.14 million average savings for each contractor, and $12.1 million savings for DOD.
- In FY 1968, 51 VECP approvals resulted in savings of $9.6 million for the five contractors, $1.92 million average savings for each contractor, and $16.7 million savings for DOD.
- In FY 1969, 71 VECP approvals resulted in savings of $14.7 for the five contractors, $2.94 million average savings for each contractor, and $47 million savings to DOD.

These five companies have increased their hi-dollar approvals, with consequent increases in their share of the savings as well as the savings to DOD. It is interesting to note that these five contractors were responsible for over 50 percent of VECP savings to the DOD in FY 1969.

If more contractors were doing equally well, the savings to DOD and to industry would be several magnitudes greater. A Logistics Management Institute estimate of a $200 million potential in VE savings appears to be very conservative.

Two Examples

One example of VE improvements concerns the minigun, an airborne machine gun produced by the General Electric Co.'s Aircraft Equipment Division, Burlington, Vt. The facts of this case were presented by W. F. Kurth of General Electric at a DOD-Industry VE Conference at Gaithersburg, Md., in December 1969.

During the period of 1965 through 1969, 73 VECPs were approved on this gun. The contractor's share of the savings from these VECPs is estimated to be $1,577,000, while the DOD share of the savings is about $4,653,000. Upon completion of the sharing period, moreover, DOD retains all of the future savings.

Reliability also improved markedly. Reliability (mean rounds between failures) increased from 47,000 rounds to 650,000 rounds. These figures include only VECPs and failures on the gun, and are based upon firing of approximately 73 million rounds.

A concurrent improvement in maintainability was achieved based on the cost of firing a single round. A study was based on:

- Five hundred rounds fired.
- Actual gun costs in 1965 and 1969.

Richard E. Biedenbender is Director for Value Engineering, Office of Assistant Secretary of Defense (Installations and Logistics). He was the first full time value engineering project officer in the Office of the Secretary of Defense.

Rudy H. Kempter is Deputy Director for Value Engineering, Office of Assistant Secretary of Defense (Installations and Logistics). Before joining the Office of the Secretary of Defense, he served as a program manager with the Navy.

- Gun life as designed in 1965 versus estimated life in 1969. (Estimated gun life has grown from 100,000 rounds in 1965 to 500,000 in FY 1969. Several guns have exceeded 7.5 million rounds.)
- Spare parts usage as defined in technical orders in 1965 and the costs of these parts.

The cost to fire a single round decreased from 3.7 cents to approximately 0.5 cents during the period that the 73 VECPs were approved.

A second case was discussed by Dr. N. I. Hall, Vice President of Hughes Aircraft Co., at the Air Force Systems Command-Industry VE Symposium at the Air Force Academy in September 1969.

Figure 2 shows Hughes Value Engineering Change Proposal activity since March 1964. Prior to that date, VE cost reduction results were achieved on non-contractual (Class II) changes. VE activity on two of these programs, the Phoenix and Maverick missiles, are of particular interest.

The Phoenix program had a Value Engineering Program Requirement clause with a 75/25 share pattern in research, development, test and evaluation, and an 80/20 share pattern for production of the first 89 missiles. The Navy's objective was to reduce the cost of the missile by 33 percent. The development phase has recently been completed with a 37-percent net reduction in costs for initial production of 89 missiles. After the cost of the VE program is deducted, the net decrease in cost is $7.7 million. Many of the VE changes resulted in improvement and simplification of design in such a way that reliability was increased by 30 percent, weight was reduced by 11 pounds per missile, maintainability was improved, and power requirements were reduced. Such results are not uncommon with proper application of the VE discipline.

The VE program on the Maverick missile is of particular interest since it was conducted with performance/design specifications, rather than detailed end item hardware configuration specifications.

Thirteen of 21 VECPs already approved relate to software portions of the contract—data items, reports, displays, including five modifications of test requirements. This is in sharp contrast to the better known hardware type of VECPs stressed on most programs, and illustrates that VE potential exists on performance type specification contracts as well as on those contracts with detailed design requirements.

The Future

To see the possible future of VE application, we need to examine the general environment within which VE will live, the assets VE possesses for serving management needs during the 1970s, and current VE trends.

Factors in the general and overall management environment which will affect VE are:

- Greater concern over defense costs.
- Continued growth in our technology development.

The first factor is manifested in numerous ways, but perhaps most importantly in changing Congressional attitudes. These attitudes, in turn, create a greater need within the De-

Hughes Aircraft Co. VECP Activity

March 1964–January 1970

Program	Number of VECPs Accepted	Hughes' Share (Earnings) Instant	Follow-on	Total	Customer Share (Savings)
Minuteman Electronics	5	$168,600		$168,600	$253,400*
Interceptor Improvement	7	671,000		671,000	821,000
MA-1 Fire Control System	1	11,400		11,400	11,400
AIM-4D Missile	6	859,500		859,500	859,500
Walleye Missile	2	43,600		43,600	43,600
HS 308 Satellite	1	6,400		6,400	6,400
407L Operation Centers	2	133,000		133,000	133,000
Sensor Reporting Post	3	81,000		81,000	81,000
Modems	1	6,700		6,700	60,300
Mark I B	1	18,600		18,600	18,600
Maverick Missile	21	389,100	$678,200	1,067,300	2,490,300
TOW Missile	22	160,400	425,000	585,400	1,306,200
Phoenix Missile	30	168,300	1,260,000	1,428,300	6,300,000
TOTALS	102	$2,717,600	$2,363,200	$5,080,800	$12,384,700

*Hughes subcontract from The Boeing Co.

Figure 2.

fense Department for management use of VE to stretch scarcer DOD resources.

The second factor also favors continued survival of VE. To a large degree, VE could simply be defined as an economically advantageous technical change. As science and technology grow, so does the VE opportunity. Thus, both the management need and technical base for VE seem favorable for increased use in the 1970s.

VE has formidable assets. It has definition, policy, directives, procedures, methodology, handbooks, contract incentives, people, a technical society, and an evolving management approach. At the level at which it performs best, VE has no existing competitors. Systems analysis and cost effectiveness operate at higher levels. Industrial engineering focuses on manufacturing, primarily. Standardization complements, rather than competes with it. If management sees a need for something like VE, it therefore seems logical to build upon an existing base than to start from scratch without nothing.

From a management approach to VE programs, what are some trends within DOD? We stated earlier that one of the stumbling blocks to earlier progress was lack of effective approach to the integration of VE into the mainstream of activity. We now appear to be approaching general agreement to the solution of this problem. The old picture of VE as a small group of people independently "second-guessing" production items is a "Model T" version that is now largely passé. The current trend in industries with successful programs has the VE group operating, not as a second guesser or competitor, but as a staff and catalytic agent. Value engineers assist line and program management in achieving goals delegated from top management. Resources are allocated specifically to find VE opportunities by reviewing high cost areas, by questioning specifications, by applying new advances in technology, and by searching for possible economies due to changes in the user's needs or new knowledge gained in feedback from test or use. These can be spotted most easily by line personnel familiar with the item at hand, provided they are motivated and trained to look for them.

In the current approach to VE, management sets goals to motivate widest possible participation by line and program management personnel. Management also allocates training and resources to provide the skills and tools necessary for these personnel to perform effectively.

This is the direction in which the DOD Value Engineering Program is moving today.

No discussion of this sort would be complete without an assessment of potential. A viable DOD Value Engineering Program during the 1970s should be capable of saving the Defense Department a billion dollars in resources each year. This figure may seem startling at first glance, but a close inspection of the potential versus current achievements makes this a realistic estimate. It is based upon VE savings inhouse, use of VE program requirement clauses, contractor-initiated Value Engineering Change Proposals, and savings from contractor Class II type VE changes.

The Value Engineering Program stands today at the threshhold. The severely limited economics of defense dictate growing management need for a program of this sort.

If management more widely recognizes emerging VE success patterns, VE will be a "billion dollar baby" in DOD during the 1970s.

NAVAIR Relocated

The Naval Air Systems Command has completed the move of its personnel from the Navy Department ("Main Navy") and Munitions Buildings on Constitution Avenue, Washington, D.C., to the new Jefferson Plaza office buildings on Jefferson Davis Highway, Arlington, Va., just south of the Pentagon.

The mailing address of Naval Air Systems Command offices is not changed (Office Name, Code, Naval Air Systems Command, Navy Department, Washington, D.C. 20360). Information on telephone numbers may be obtained by calling (202) OXford 7–0111.

The working hours of personnel at Jefferson Plaza have been set at 7:15 a.m. to 3:45 p.m.

AFA Annual Convention, Briefings and Displays Set for September 21–24

The Air Force Association (AFA) 1970 National Convention, now combined with its Aerospace Development Briefings and Displays, will be held at the Sheraton Park Hotel, Washington, D.C., September 21–24.

The convention program includes a luncheon on September 22 honoring General John D. Ryan, Air Force Chief of Staff, at which he will be the principal speaker. A luncheon on September 23 will honor Secretary of the Air Force Robert C. Seamans Jr., at which he will deliver the principal address. Other features of the program are an Air Force Reserve Seminar on September 22 and an Air Force Symposium covering the threat to national security on September 23. A reception and banquet, observing the 23rd anniversary of the Air Force, will close the convention on the evening of September 24.

The Aerospace Development Briefings and Displays will be held September 22, 23 and 24. More than 50 companies will present the latest aerospace and defense systems and equipment. The program combines displays of equipment with company presentations in individual booths on a scheduled basis. Morning attendees are escorted to each briefing in the group selected. Afternoon attendees may select any of the briefings offered in any order of preference.

This year's briefings will include presentations on the B–1 aircraft, rocket propulsion, communications, avionics, advanced composites, laser fire control, navigation, engine development, V/STOL, and other timely developments.

ESD Communications Deputate Moved

The Deputate for Communication Systems, Electronic Systems Division, Air Force Systems Command, has moved from the Waltham, Mass., Federal Center to Building 1618 at L. G. Hanscom Field, Bedford, Mass.

Colonel Robert J. Kuehn is Deputy for Communications Systems.

ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Vice Adm. John V. Smith, USN, has been named Commandant, Industrial College of the Armed Forces.

Raymond G. Leddy has been designated Dir., Military Assistance and Sales, Office of the Asst. Secretary (International Security Affairs).

Recent assignments in the Defense Supply Agency include: **Brig. Gen. John S. Chandler**, USAF, Commander, Defense Contract Administration Services Region, Los Angeles, Calif.; **Brig. Gen. (designee) Paul E. Smith**, USA, Commander, Defense Industrial Supply Center; and **Col. Claude G. Baughman**, USA, Commander, Defense Industrial Plant Equipment Center, Memphis, Tenn.

DEPARTMENT OF THE ARMY

Maj. Gen. (selectee) James G. Kalergis is the new Dep. Commanding General for Logistics Support, Army Materiel Command. Replacing Gen. Kalergis in his former position as AMC Comptroller is **Brig. Gen. (selectee) Hal E. Hallgren.**

Brig. Gen. Herbert J. McChrystal Jr. has been designated Dir., Force Planning Analysis, Office of Asst. Vice Chief of Staff.

Brig. Gen. Ralph Richards Jr. is now the Chief of Finance and Accounting, Office of the Comptroller of the Army.

Brig. Gen. Elmer P. Yates has been named Dir. of Installations, Office of Dep. Chief of Staff for Logistics, Dept. of the Army.

Brig. Gen. (selectee) Dean Van Lydegraf has assumed command of the U.S. Army Natick Laboratories, Natick, Mass.

Dr. John L. McDaniel has been named Dir. of Research and Engineering, Army Missile Command, Huntsville, Ala.

Col. William C. Ohl has been designated Commander, Army Materiel Command Field Office, Sandia Base, Albuquerque, N. Mex.

Two new assignments within the Corps of Engineers are: **Brig. Gen. John W. Morris**, Div. Engineer, Missouri River Div., Omaha, Neb.; and **Col. Richard M. Connell**, District Engineer, Walla Walla District, Walla Walla, Wash.

DEPARTMENT OF THE NAVY

Vice Adm. J. D. Arnold will perform the duties of Chief of Naval Material and Commander, Naval Materiel Command. He replaced **Adm. I. J. Galantin**, who has retired. Other new assignments within the Naval Materiel Command are: **Rear Adm. Kenneth R. Wheeler**, Commander, Naval Supply Systems Command and Chief of the Supply Corps; **Rear Adm. Wallace R. Dowd Jr.**, Vice Commander, Naval Supply Systems Command; **Rear Adm. Robert L. Baughan Jr.**, Vice Commander, Naval Ordnance Systems Command; and **Capt. Walter R. Fraser**, Dir., Photographic Div., Naval Air Systems Command.

Rear Adm. Ernest E. Christensen has been named Asst. Dep. Chief of Naval Operations (Development).

Rear Adm. William M. Harnish has been designated Dep. Naval Comptroller, Department of the Navy, and **Rear Adm. Sam H. Moore** has been named Dir. of the Budget and Reports, Office of the Naval Comptroller.

Rear Adm. Carl Q. Holmquist is the new Chief of Naval Research, Washington, D.C.

DEPARTMENT OF THE AIR FORCE

Lt. Gen. (selectee) Richard H. Ellis will be assigned as Vice Commander in Chief, United States Air Forces, Europe, effective Sept. 1. He will replace **Lt. Gen. George B. Simler**, who will become Commander, Air Training Command, Randolph AFB, Tex.

New assignments in Hq., USAF, are: **Maj. Gen. Carlos M. Talbott**, Dir. of Operations, Office of Dep. Chief of Staff, Planning and Operations; **Brig. Gen. Jonas L. Blank**, Dir., Supply and Services, Office of Dep. Chief of Staff, Systems and Logistics; **Brig. Gen. Theodore S. Coberly**, Dir. of Reconnaissance and Electronic Warfare, Office of Dep. Chief of Staff, Research and Development and **Brig. Gen. (selectee) John J. Burns**, Dep. Dir. for General Purpose and Airlift Forces, Office of Dep. Chief of Staff, Research and Development.

In Air Force Systems Command, **Maj. Gen. Paul T. Cooper** has been named Dir. of Laboratories, Hq., AFSC. He replaced **Brig. Gen. Raymond A. Gilbert**, who has retired.

Other new assignments in AFSC include: **Maj. Gen. John B. Hudson**, Vice Commander, Aeronautical Systems Div., Wright-Patterson AFB, Ohio, (previously reported for reassignment as Vice Commander, Space and Missile Systems Organization, Los Angeles AFS, Calif.); **Maj. Gen. Clifford J. Kronauer**, Chief of Staff, AFSC (previously announced to be Dep. Chief of Staff, Operations); **Maj. Gen. Edmund F. O'Connor**, Dep. Chief of Staff, Procurement and Production, replacing **Maj. Gen. Fred J. Higgins** who retired; **Brig. Gen. Louis O. Adler**, Dep. Chief of Staff, Comptroller; **Brig. Gen. Warner E. Newby**, Systems Program Dir., C–5A, Aeronautical Systems Div., Wright-Patterson AFB, Ohio; **Brig. Gen. Alton D. Slay**, Dep. Chief of Staff, Operations; **Brig. Gen. (selectee) Abner B. Martin**, Dep. for Re-Entry Systems, Space and Missile Systems Organization, Norton AFB, Calif.; and **Brig. Gen. (selectee) Robert M. White**, Commander, Air Force Flight Test Center, Edwards AFB, Calif.

Maj. Gen. George J. Keegan Jr. will become Dep. Chief of Staff, Plans and Operations, Air Force Logistics Command, Wright-Patterson AFB, Ohio, effective Aug. 25.

Contract Awarded for New Class Destroyers

The Navy has awarded a $2.14 billion contract for construction of 30 multi-purpose destroyers to Litton Industries, Inc.

The fixed-price incentive, multi-year contract provides for funding the ships in five consecutive annual procurement increments, each subject to Congressional approval. The first increment of $214 million for three ships was funded last year. The second increment, for six ships, is now before Congress. Total eventual cost to the Government, including cost of government-furnished radars and weaponry, is estimated at $2.55 billion.

Formerly known as the DX or DD–963, the first ship in the new class will be named in honor of the late Admiral Raymond A. Spruance. Delivery is expected in the fall of 1974.

The Spruance class destroyers will be the first ships designed and manufactured under the concept formulation/contract definition/multi-year acquisition process, in which design and construction is managed by a single firm. Six major U.S. shipbuilders were in the initial competition in 1968. Competing with Litton Industries, Inc., in the final stage was Bath Iron Works Corp., Bath, Maine.

The Spruance class destroyers will be built at the new west bank facility of Litton's Ingalls Shipbuilding Division, Pascagoula, Miss. More than 60 percent of the dollar value of each ship will be used to purchase materials and equipment from subcontractors in 45 states.

The Maritime Administration has certified the company as being in compliance with the equal employment opportunity requirements of Presidential Executive Order 11246 and Order Number 4 of the Federal Contract Compliance Office of the Department of Labor.

The Spruance class is the first general purpose destroyer construction program since the late 1950s. It will be the backbone of the Navy's destroyer force in the 1970s and beyond.

Four gas turbine engines will power each destroyer to speeds in excess of 30 knots. The 559-foot 11-inch ship will have a 54-foot beam, and will displace 7,000 tons.

Primary mission of the destroyers is antisubmarine warfare. They will also have capability for shore bombardment and surface warfare. They will be armed with two 5-inch guns, Seasparrow missiles for defense against airborne threats, standard and rocket-assisted projectiles, and antisubmarine torpedoes and rockets. Sensors will include air and surface search and fire control radars, long range sonar, and electronic warfare equipment. The ships will be equipped with an underwater surveillance and communication system to detect, track and classify targets. They will have a unique combat information center, a centralized location with all information and displays to command the ship's full weapon system capability.

Effectiveness against submarines is expected to be far greater than that of current ships, particularly at high speeds, due to ship silencing techniques and improved seakeeping capabilities. The ships will be equipped to operate manned helicopters, which will extend antisubmarine attack capability and electronic warfare detection beyond the horizon.

Other missions include escort for military and merchant convoys, surveillance and trailing, blockade, and search and rescue.

The form of the ship's hull was designed to minimize roll and pitch of the ship at sea, thus achieving highest accuracy of the weapon systems. The hull design also reduces resistance and drag of the ship in the water, resulting in fuel savings at high speeds.

Each new destroyer will be manned by 270-man crews, less than required for a conventional destroyer of similar size and lesser capability. Crew reduction was made possible by using materials requiring minimum maintenance and by maximizing automation in propulsion and electrical systems. For example, one man at the ship's console controls steering and speed. Reduction in crew size will result in operating cost savings of $500,000 annually.

Conventional and regulatory standards for crew comfort and habitability have been exceeded. Living areas are sound insulated and located near midship, away from noise producing machinery. The midship location also minimizes crew exposure to ship motion. Berths are arranged in groups, with partitions, lockers and recreational tables forming "buffer zones" and creating maximum privacy. Sanitary facilities and recreational areas are located near each berthing group. The messing complex is also centrally located. Two independent main passageways allow easy and rapid movement of traffic with minimum disturbance to sleeping personnel.

Incorporated into the design of the destroyers are systems that will reduce water and air pollution. An electromechanical shipboard sewage treatment plant will process waste by separating and incinerating solids and chemically treating liquids. Existing passive methods collect waste in tanks for offloading into barges in port.

The destroyers will reduce oil pollution by collecting waste lubricants and oil in storage tanks for discharge in port into barges or a shore facility. The gas turbine engines operating on Navy distillate fuel will reduce soot in smokestacks and black smoke emissions into the air while in operation.

Litton Industries will assist the Navy in teaching new crews to operate the ships, and will develop texts and training aids for new and modified equipment.

Remote Weather Station Air-Dropped, Expendable

A $320,000 contract has been awarded by the Air Force Cambridge Research Laboratories to Honeywell's Aerospace Division in Florida for the development of an Expendable Remote Operating Weather Station (EROWS) for use by the Air Weather Service. Designed to be dropped in remote, inaccessible areas, the weather station is cylindrical, about 8 feet long and 6 inches in diameter, and weighs 55 pounds. Dropped from an aircraft, it is stabilized and descends to the ground on four rotating blades, each 2.5 feet long. A spear-like tip imbeds itself in the ground and a 5.7 foot vertical dipole antenna is automatically raised into position.

A 4-pound sensor package near the top gathers data about wind speed and direction, atmospheric pressure, temperature, humidity, precipitation, and cloud cover. The data is then transmitted through FM telemetry equipment to a master control station, capable of handling 10 EROWSs. The master station will include an interrogation module to display the exact status of the EROWS being sensored, and will be able to perform a remote checkout of the EROWS.

Final unit cost of the EROWS is estimated to be in the $1,000 range.

The Netherlands Join NATO Seasparrow Missile Program

The Netherlands has become the fifth NATO country to join the NATO Seasparrow Project, a cooperative development program designed to produce a second generation point defense antimissile weapon system.

Originally set up among Denmark, Italy, Norway and the United States, the initial contract for development of the Seasparrow Surface Missile System was issued in September 1969.

Participating countries share the development costs in proportion to the number of subsystems each acquires for use. This cooperative effort is expected to benefit participants through pooled research and development efforts. Each nation will be furnished a complete production data package and a share in the production.

The development contract calls for three engineering and development models, complete with all supporting equipment, spare parts and documentation. One system will be tested by the U.S. Navy, one will be delivered to Norway for operational testing, and one will remain at the contractor's plant for systems evaluation.

Overall control of the program resides in a board of directors, consisting of a senior representative from each country and called the NATO Seasparrow Project Steering Committee. Voting power of each member is in direct proportion to his country's development cost share. Changes of major impact require unanimous consent.

The NATO Seasparrow Project Office, opened in Washington, D.C., in July 1968, is headed by a project manager, with representatives from each participating country. The Naval Ordnance Systems Command acts as support for the office on contracts, legal services, security and some administrative areas.

The Seasparrow system is designed to be used against hostile aircraft, missiles and surface targets. It consists of a combination illumination and target-tracking radar, and Sparrow missiles stored in and fired from cell-type launchers. Digital computation will be used in solving fire control problems.

A Market for Small Business

Individually and collectively, small business concerns contribute indispensably to America's security and economic well-being. Congress has declared the policy that Government shall aid, counsel, assist and protect the interests of small businesses.

One area of special interest to many small business firms is subcontracting. Defense producers holding individual orders of $500,000 or more are contractually obligated to establish and conduct formal small business subcontracting programs. Large contractors agree to make available opportunities for small business to compete for subcontracts and orders generated by prime contract production.

The Defense Contract Administration Services (DCAS) of the Defense Supply Agency administers about 210,000 prime contracts worth $50 billion held by more than 20,000 firms. About 50 percent of the average contract face value is expended on subcontracts for materials, parts and services. Of the amount subcontracted by DCAS-assigned prime contractors, about 47 percent is awarded to small businesses.

A small business advisor in each DCAS region or district is responsible for assuring that prime contractors comply with their obligation to small business. These advisors accumulate valuable leads on purchasing requirements in their respective areas through close working relationship with prime contractors. These leads and production information are passed on to small business firms in an effort to increase and strengthen small business participation in military contracting.

Directories containing names and product lines of principal prime contractors are published as marketing aids for potential subcontractors. Readers are encouraged to solicit the counsel, assistance and advice offered by the nearest DCAS small business advisor.—**Lloyd C. Alderman, Assistant Small Business and Labor Surplus Advisor, Defense Contract Administration Services, Defense Supply Agency.**

DCAS Small Business Advisors

DCAS Region, Atlanta
Adee F. Thompson
3100 Maple Drive NE
Atlanta, Ga. 30305
Phone: (404) 261-7310, Ext. 270

DCAS District, Birmingham
Nolan L. Shory
908 S. 20th St.
Birmingham, Ala. 35205
Phone: (205) 325-3384

DCAS District, Orlando
DeFarest A. Long Jr.
Naval Training Center
Orlando, Fla. 32813
Phone: (305) 646-5077

DCAS Region, Boston
Edward J. Fitzgerald
666 Summer St.
Boston, Mass. 02210
Phone: (617) 542-6000, Ext. 886

DCAS District, Hartford
John R. Reardon
555 Asylum Ave.
Hartford, Conn. 06105
Phone: (203) 244-3336

DCAS District, Rochester
Kenneth E. McMahon
317 Child St.
Rochester, N. Y. 14611
Phone: (716) 328-7670

DCAS Region, Chicago
Lorne S. Kuffel
O'Hare International Airport
P. O. Box 66475
Chicago, Ill. 60666
Phone: (312) 694-3031, Ext. 6390

DCAS District, Indianapolis
Alfred A. Haboush
Finance Center, U. S. Army
Building 1
Ft. Benjamin Harrison, Ind. 46249
Phone: (317) LI 6-9211, Ext. 3155

DCAS District, Milwaukee
Charles F. Loch
744 N. 4th St.
Milwaukee, Wis. 53203
Phone: (414) 272-8180, Ext. 206

DCAS Region, Cleveland
Harold A. Johns
Federal Office Building
Room 1855
1240 E. Ninth St.
Cleveland, Ohio 44199
Phone: (216) 522-5221

DCAS District, Cincinnati
Gene Luke
Federal Office Building
550 Main St.
Cincinnati, Ohio 45202
Phone: (513) 684-3915

DCAS District, Dayton
Paul E. Birkhold
c/o Defense Electronics Supply Center
1507 Wilmington Pike
Dayton, Ohio 45401
Phone: (513) 252-6551

DCAS Region, Dallas
George R. Phillips
500 S. Ervay St.
Dallas, Tex. 75201
Phone: (214) RI 9-3207

DCAS Region, Detroit
Donald B. Leakhy
1508 E. Grand Blvd.
Detroit, Mich. 48211
Phone: (313) 923-0100, Ext. 265

DCAS Region, Los Angeles
Max M. Bennett
11099 S. LaCienega Blvd.
Los Angeles, Calif. 90045
Phone: (213) 643-0620

DCAS District, Phoenix
Charles P. Fink
3800 N. Central Avenue
Phoenix, Ariz. 85012
Phone: (602) 261-4467

DCAS Region, New York
Theodore M. Everett
60 Hudson St.
New York, N. Y. 10013
Phone: (212) 264-0833

DCAS District, Garden City
Wilbur V. Gould, Jr.
605 Stewart Ave.
Garden City, N. Y. 11533
Phone: (516) PI 1-8000, Ext. 379

DCAS District, Springfield
Peter P. Gitto
240 Route 22
Springfield, N. J. 07081
Phone: (201) 379-7950

DCAS Region, Philadelphia
Albert B. Feldman
P. O. Box 7478
Philadelphia, Pa. 19101
Phone: (215) 271-4006

DCAS District, Baltimore
Robert A. MacMillan
Building 22, Ft. Holabird
Baltimore, Md. 21219
Phone: (301) 527-3147

DCAS District, Pittsburgh
George A. Griner
1610 S. Federal Building
1000 Liberty Ave.
Pittsburgh, Pa. 15222
Phone: (412) 644-5972

DCAS Region, St. Louis
Harold W. Nutt
1136 Washington, Ave.
St. Louis, Mo. 63101
Phone: (314) AM 8-6223

DCAS District, Twin Cities
Roman T. Schumacher
Ft. Snelling Federal Building
Twin Cities, Minn. 55111
Phone: (612) 725-3808

DCAS Region, San Francisco
Raymond R. Govea
866 Malcolm Road
Burlingame, Calif. 94010
Phone: (415) 692-0300, Ext. 523

DCAS District, Seattle
Arthur W. Perry
Building 5D
Naval Air Station
Seattle, Wash. 98115
Phone: (206) 527-3241

PROMAP 70

PROGRAM REFINEMENT OF MATERIEL ACQUISITION PROCESS

Major General
Paul A. Feyereisen, USA

The Defense Department is currently faced with strong pressure to reduce personnel strengths and spending. Public scrutiny is being focused on military spending more intensely than at any time in our country's history. The Armed Forces are required to reduce their force structure while still heavily involved in hostilities in Southeast Asia. Such is the environment of the government contracting marketplace in 1970.

The Army Materiel Command (AMC) will face up to this environment by positively confronting its challenges, rather than by being defensive of the past. The requirement "to do more with less" is being translated into an opportunity. AMC is exploiting this opportunity with the Program for the Refinement of the Materiel Acquisition Process—PROMAP–70.

PROMPAP–70 is an outgrowth of a memorandum issued by Deputy Secretary of Defense David Packard on July 31, 1969, in which he focused attention on the problems associated with weapon system acquisition. In this memorandum, addressed to the Secretaries of the Army, Navy and Air Force, he outlined five general areas that needed improvement:

- Excessive optimism in cost estimates.
- Control of changes in on-going programs.
- Comprehensive assessment of risk prior to system development.
- Use of competitive prototypes in developments.
- Concurrent development/test and evaluation.

AMC recognizes that frequently the Army simply has not been receiving what has been asked for from industry, and has been paying too much for what it has received. The fault lies exclusively with neither the Government nor industry. In many cases, the Army has failed to adequately analyze and to define its requirements for industry. Contractors have failed to control their resources adequately. Both the Army and industry have been excessively optimistic in estimating project costs.

The primary objective of PROMAP is to improve all areas of acquisition management. Emphasis is being placed on concrete payoffs, rather than devising new procedures and publishing new regulations. The materiel acquisition process will be looked at on a before-and-after basis in an attempt to discover opportunities to improve the overall system. The 5 broad problem areas, identified by Secretary Packard, have been divided into approximately 50 manageable tasks, each headed by a senior staff member in AMC.

PROMAP Approach

PROMAP—70 is using the current command and staff relationships which exist among the Secretary of the Army, the Army Chief of Staff, and the Army Materiel Command. AMC operating levels will be doing the majority of the program development, since major subordinate commands and separate project managers assign task directors to applicable tasks. The people who will be executing the changes are the ones involved in determining what needs to be changed.

AMC major subordinate commands, called commodity commands, are responsible for the grass roots development and implementation of PROMAP–70. The eight commodity commands are:

- Aviation Systems Command, St. Louis, Mo.
- Electronics Command, Fort Monmouth, N.J.
- Missile Command, Huntsville, Ala.
- Mobility Equipment Command, St. Louis, Mo.
- Munitions Command, Dover, Del.
- Tank–Automotive Command, Detroit, Mich.
- Test and Evaluation Command, Aberdeen Proving Ground, Md.
- Weapons Command, Rock Island, Ill.

Each of these organizations is developing all the PROMAP tasks which apply to the respective command. With most of the tasks, the commodity commands must coordinate their efforts so that an overall AMC position is established, applicable throughout the Army. In many instances, the commands will be working with industry representatives in developing acquisition improvements in the business-government contracting interface.

PROMAP Tasks

The best way to describe exactly what the PROMAP–70 tasks entail is to look at each problem area defined by Secretary Packard, and discuss it in relation to PROMAP. The chart on pages 20 and 21 depicts how each PROMAP task fits into the materiel acquisition phases of the life of the weapon system.

Excessive Optimism in Cost Estimates. Government statistics indicate that the largest single cause of cost growth in materiel acquisition is over-optimism in cost estimates for major weapon systems. Much of this results from the tremendous competition for programs among contractors. In some cases it is also a product, with the military services, of competition among programs for limited financial resources.

Major General Paul A. Feyereisen, USA, is Deputy Commanding General for Materiel Acquisition of the Army Materiel Command. Before assuming this position, he served at AMC headquarters as Director of Materiel Requirements. In 1966, General Feyereisen was named U.S. Program Manager for the MALLARD Project, and later was given additional duty as Deputy Commanding General of the Army Electronics Command for Tactical Communication Systems. He is a graduate of the University of Minnesota, Harvard University School of Business Administration, and the National War College.

To change this situation, defense contractors must come to grips with the need for cost realism in their proposals. In turn, the Government must make cost realism a major factor to be considered in source selection. To accomplish this end, it is incumbent upon the Government to make a distinct improvement in its cost estimating and validating capability, as well as to ensure that this estimating capability is fully and effectively applied by the source selection authority.

Nine of the 50 PROMAP tasks address themselves specifically to improved cost estimates. Actual pilot weapon systems will be studied to aid in improving documentation and cost estimating methods. With improved documentation and estimating methods, the Army can arrive at independent, realistic forecasts prior to commitment to a single course of action. The Army will develop "should cost" estimates not only to enhance its negotiating position, but also to point up ways in which contractor operations can be improved. PROMAP will establish milestones in the acquisition cycle of programs at which a consolidated recomputation of the cost estimate will be made. If at any time the cost estimate exceeds a pre-established threshold, an in-depth appraisal of the program risks and status will follow.

Control of Changes in On-going Programs. Changes made in a program, during both the development phase and the production phase, are also major contributors to cost growth. Improvements in this area can be achieved by:

- Ensuring complete, specific definition by the Government of what is needed in a system before beginning full scale development.
- Vigorous review and elimination of the many "nice" or "desirable" features which so often creep into major systems as they proceed through development and production.

The greatest cost impact of changes is from unpriced change orders, since their cost is not negotiated during contract performance. While the ideal solution would be prohibition of any unpriced changes, this is not practical in the majority of cases. PROMAP tasks, therefore, will seek to increase control over the approval of changes and ensure that their total system impact is properly evaluated.

A Configuration Control Review Board is being established at AMC headquarters to ensure adequate evaluation of major engineering change proposals. A Change Control Center is also being established at one of AMC's commodity commands. This will be a pilot test to determine desirability of its application throughout the Army Material Command. The Change Control Center will evaluate proposed engineering changes in terms of cost, schedule, and technical impact, and will provide command level visibility to all changes. One PROMAP task is designed to identify each over-age change order in excess of $10,000 to determine the cause of delay and to establish, in coordination with the commodity commands, a realistic, time-phased plan for finalization.

Comprehensive Assessment of Risk Prior to System Development. There is a need to better identify risks associated with major programs and to do a thorough job in completing prerequisites to contract definition. Failure to do this can result in disruption of schedule and increase in program cost. Risk analyses should be made when developing Qualitative Materiel Requirement/Qualitative Materiel Development Objectives documents,[1] and during each succeeding stage of the acquisition process—contract definition, source selection, engineering development, and production.

One PROMAP–70 task has been designed to use prototype demonstration, when feasible, to analyze technical risk. Prototype demonstration would provide valuable cost and technical risk information *prior* to final source selection. Such information would preclude a prospective contractor from submitting an unrealistically low cost proposal for system development and production.

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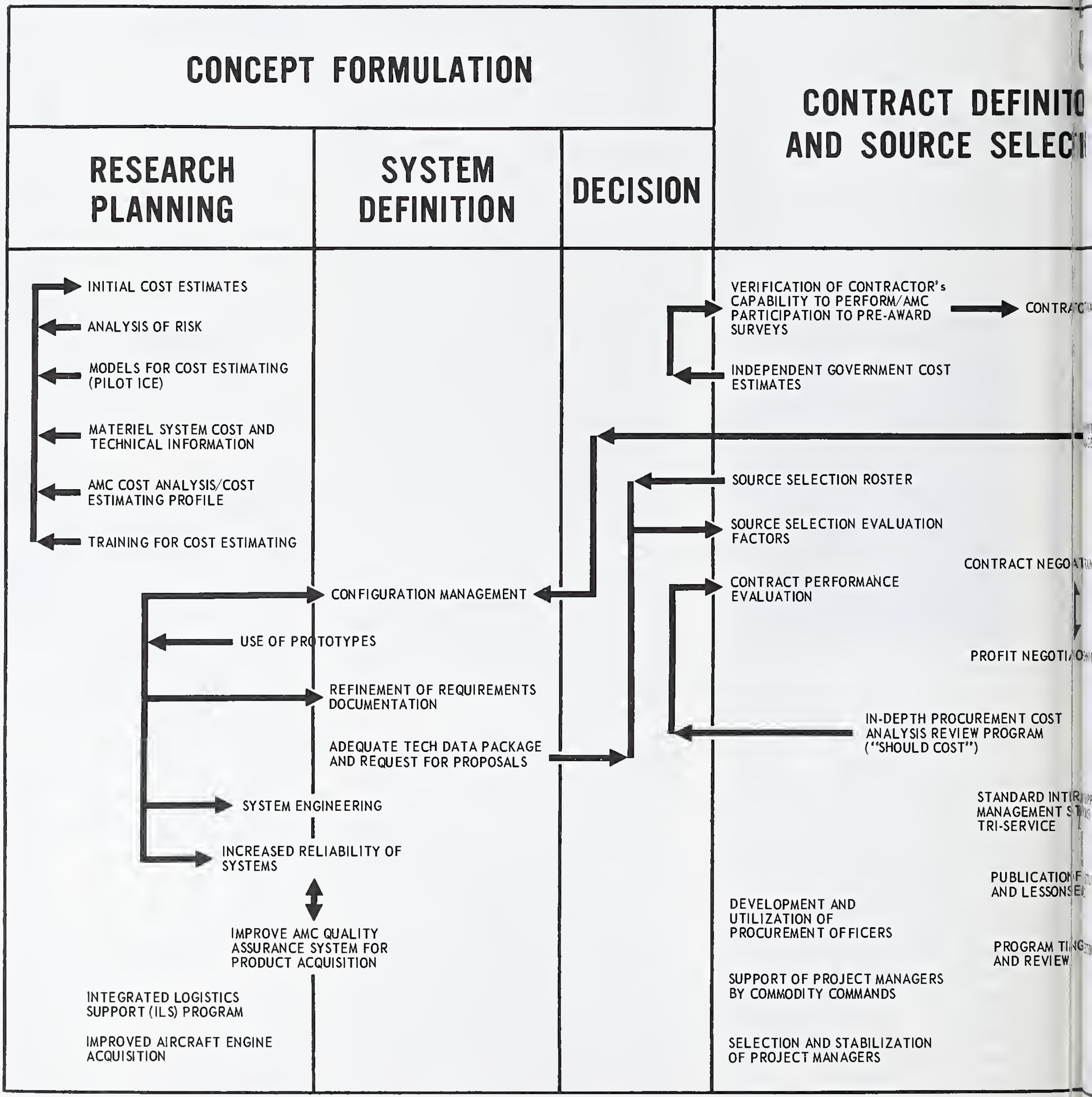
[1] *Qualitative Materiel Requirement/Qualitative Materiel Development Objectives (QMR/QMDO) are Army documents indicating military requirements and performance objectives which the combat developer needs. From these documents, the materiel developer translates requirements into new acquisition projects.*

PROGRAM FOR THE REF
ACQUISITION PRO

INTERNAL INFORMATION PLAN

REDUCTION OF NONESSENTIAL
REPORTING IN AMC


CONCEPT FORMULATION
RESEARCH PLANNING
SYSTEM DEFINITION
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AND SOURCE SELEC
INITIAL COST ESTIMATES
ANALYSIS OF RISK
MODELS FOR COST ESTIMATING (PILOT ICE)
MATERIEL SYSTEM COST AND TECHNICAL INFORMATION
AMC COST ANALYSIS/COST ESTIMATING PROFILE
TRAINING FOR COST ESTIMATING
CONFIGURATION MANAGEMENT
USE OF PROTOTYPES
REFINEMENT OF REQUIREMENTS DOCUMENTATION
ADEQUATE TECH DATA PACKAGE AND REQUEST FOR PROPOSALS
SYSTEM ENGINEERING
INCREASED RELIABILITY OF SYSTEMS
IMPROVE AMC QUALITY ASSURANCE SYSTEM FOR PRODUCT ACQUISITION
INTEGRATED LOGISTICS SUPPORT (ILS) PROGRAM
IMPROVED AIRCRAFT ENGINE ACQUISITION
VERIFICATION OF CONTRACTOR's CAPABILITY TO PERFORM/AMC PARTICIPATION TO PRE-AWARD SURVEYS
CONTRA
INDEPENDENT GOVERNMENT COST ESTIMATES
SOURCE SELECTION ROSTER
SOURCE SELECTION EVALUATION FACTORS
CONTRACT PERFORMANCE EVALUATION
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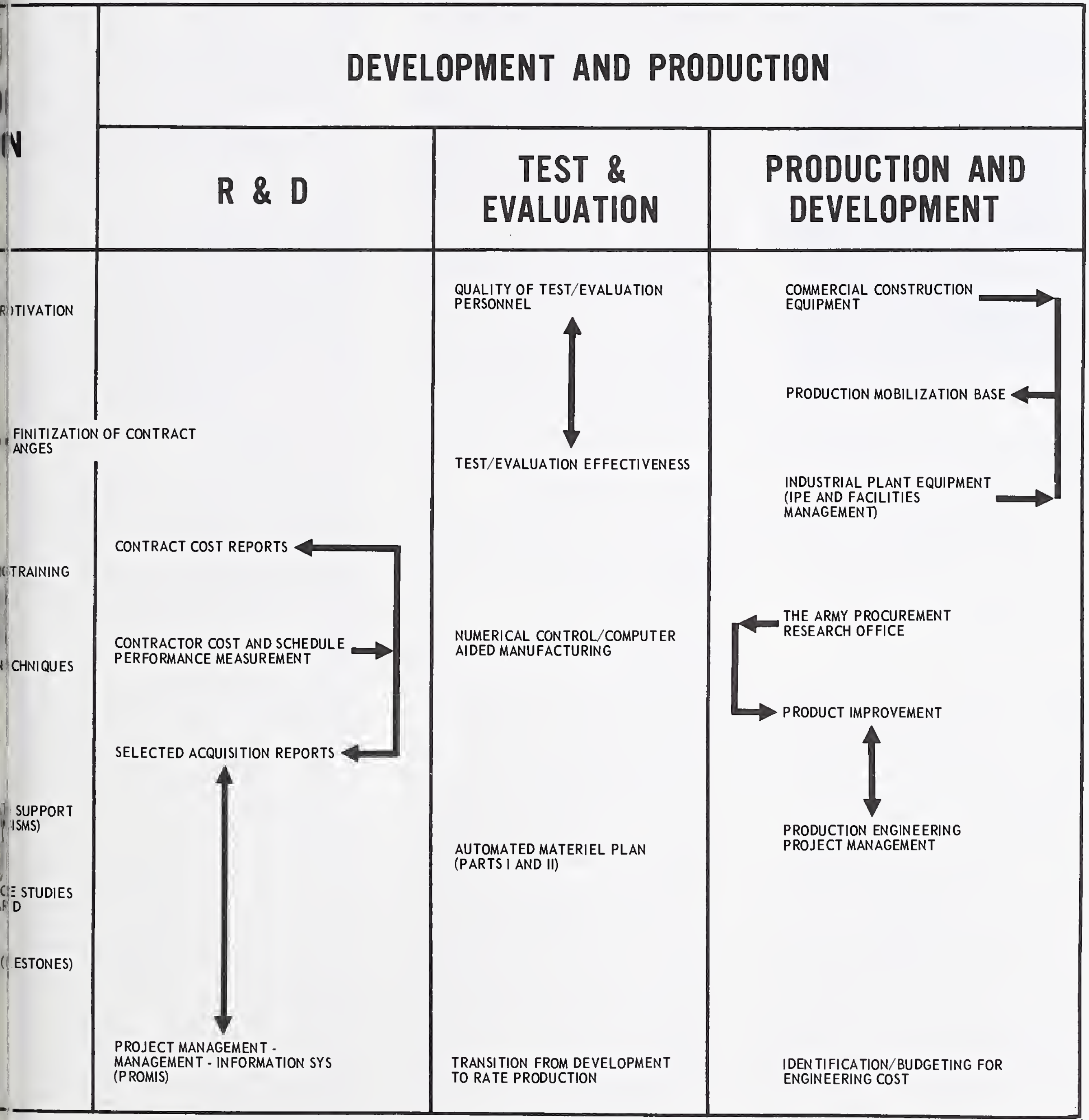
EMENT OF THE MATERIEL
SS (PROMAP - 70)

DEPARTMENT OF THE ARMY
VICE CHIEF OF STAFF
ANNUAL REVIEWS

COMMAND REVIEW - MAJOR
WEAPON SYSTEMS



DEVELOPMENT AND PRODUCTION

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SUPPORT
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D

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R & D

CONTRACT COST REPORTS

CONTRACTOR COST AND SCHEDULE PERFORMANCE MEASUREMENT

SELECTED ACQUISITION REPORTS

PROJECT MANAGEMENT - MANAGEMENT - INFORMATION SYS (PROMIS)

TEST & EVALUATION

QUALITY OF TEST/EVALUATION PERSONNEL

TEST/EVALUATION EFFECTIVENESS

NUMERICAL CONTROL/COMPUTER AIDED MANUFACTURING

AUTOMATED MATERIEL PLAN (PARTS I AND II)

TRANSITION FROM DEVELOPMENT TO RATE PRODUCTION

PRODUCTION AND DEVELOPMENT

COMMERCIAL CONSTRUCTION EQUIPMENT

PRODUCTION MOBILIZATION BASE

INDUSTRIAL PLANT EQUIPMENT (IPE AND FACILITIES MANAGEMENT)

THE ARMY PROCUREMENT RESEARCH OFFICE

PRODUCT IMPROVEMENT

PRODUCTION ENGINEERING PROJECT MANAGEMENT

IDENTIFICATION/BUDGETING FOR ENGINEERING COST

Another task has been set up to conduct reviews of risk and technical achievement periodically throughout the life of the contracts for a system. Still another will establish a procedure to back up the development of high risk components by concurrent development of less sophisticated, low risk components. The idea behind all these efforts is to isolate the principal unknowns associated with a program, to develop a risk profile based on the unknowns, and to evaluate the alternative courses of action to offset the risk involved.

Analysis of risk ties in closely with excessive optimism in cost estimates, since realistic cost forecasts must explicitly account for the probability that the system will cost more (and in some cases less) than the best estimate, because of technical uncertainties.

Use of Competitive Prototypes in Development. In general, it is felt that the Army will benefit by increasing dependence on hardware demonstration and competition, and attain some corresponding reduction in dependence on paper analysis. This must be done with recognition of the differences in susceptibility of different types and sizes of systems to this treatment. Competitive hardware demonstration before commitment to full scale development should help ensure that:

- Feasibility studies are sound.
- System is reasonably well defined.
- Cost proposals are credible.

While competitive prototype demonstration will prolong the contract definition phase, it will also result in a briefer engineering development phase, fewer engineering changes during production, and fewer contingencies in the contract price.

PROMAP–70 tasks envisage applying this expanded contract definition to three forthcoming procurements—Armored Reconnaissance Scout Vehicle (ARSV), Mechanized Infantry Combat Vehicle (MICV), and Vehicle Rapid Fire System Successor (Bushmaster). Competitive contractors, after submitting a preliminary proposal for engineering development and production, will supply prototypes for evaluation. Based on the results of prototype tests and any required technical guidance, the contractors will submit revised proposals for development and production. The source selection authorities will consider both the revised proposals and the results of prototype testing in awarding the contract.

In those cases where prototypes of the entire system are not needed or prove to be too costly, the Army will conduct competitive tests of prototypes of critical major components.

Concurrent Development/Test and Evaluation. The quality of test and evaluation, performed on a developmental weapon system before commitment of significant resources for production, is another area in which improvement will be sought. PROMAP is developing a plan for changes based on these guidelines:

- Clear designation of responsibility and capability to review and monitor testing, test planning activities, and test results throughout the Army.
- Procedure for providing accurate, objective summaries and key data to all interested agencies, particularly in connection with in-process reviews and major milestone reviews.
- Policy which will extend test and evaluation to product improvement programs, as appropriate.
- Assurance of involvement in the test process of military user representatives at as early a date as practical before substantial production decisions are made.

The Army intends to more clearly compartmentalize the development and production phases of new weapon systems acquisition. To provide a more orderly and controlled transition, the Army will make use of production options in engineering development contracts, with the production decision keyed to major milestone reviews, *e.g.*, a review at completion of engineer and service tests. The intent here is that for some contracts, and subsequent to major milestone reviews, the developer will have the option to follow-on production of the item to provide a more orderly and controlled transition from development to production. Other producers will not be barred from competing for rate production work; this option is for limited production runs to facilitate transition and test various production alternatives.

To ensure that the necessity to maintain contractor effort does not influence a hasty decision to produce, a development contract will include a priced option that permits deferring the production decision incrementally up to one year after the accomplishment of the engineering test/service test milestone. PROMAP will apply this technique to the development programs for the three major weapon systems previously mentioned—ARSV, MICV and Bushmaster—in order to evaluate their effectiveness and cost.

The foregoing discussion briefly describes AMC's plan to refine the materiel acquisition process. PROMAP began in January 1970. Many of its tasks have already developed new ways of doing business. For example, Army procedures and documentation used to develop materiel requirements underwent thorough study. As a result, a single requirements document was established to replace four previous documents. Processing time was reduced from 2½ years to 30 weeks. Also, new procedures were developed to allow for tradeoff considerations between operating requirements and technical design.

Another study was conducted to evaluate the Army's cost estimating capability. On the basis of its findings, AMC received authorization to increase the number of its cost estimating personnel from 530 to 780, and to establish 7 new cost data centers.

The Army has also conducted an in-depth procurement cost analysis review at Raytheon Co. to appraise the reasonableness of direct and indirect costs in proposals for the Improved Hawk missile. The results of this important "should cost" study had not been approved for release at the time this article was written.

PROMAP–70 is an ambitious program in that it is designed to get large numbers of people to change methods of operating, and to improve the overall materiel acquisition process. It is the Army Materiel Command's response to the Secretary of the Army's plan to improve the acquisition process. It is an excellent opportunity for the Army and its supporting contractors to do "more with less" in the decade of the 1970s.

FROM THE SPEAKERS ROSTRUM

Beyond the 1970s—What?

Address by Hon. Philip N. Whittaker, Asst. Secretary of the Air Force (Installations & Logistics), before the 1970 National Aerospace Electronics Conference sponsored by the Institute of Electrical and Electronics Engineers, Dayton, Ohio, May 18, 1970.

The role of prophet is an uneasy one . . . since it seems to imply some special wisdom and clairvoyance to which, most assuredly, I lay no claim. As a matter of fact, I have long admired Herbert Hoover's attitude toward prophecy—as he said, "Wisdom consists not so much in knowing what to do in the ultimate as in knowing what to do next."

I remember the closing comments of Secretary [of the Air Force] Seaman's speech to the Town Hall of California in Los Angeles last fall. He quoted a recent British Ambassador to Washington as remarking that man is a peculiarly constructed animal who can't read the handwriting on the wall until he has his back to it.

And then Secretary Seamans said, "I certainly hope that we will not find ourselves fitting this description. I also hope that our domestic needs and security requirements are met and satisfied with the dedication and industry that has always characterized America's endeavors. To do otherwise is to court disaster—with our backs to the wall."

That is a challenge. Let's see if we can read the handwriting on the wall for the 1980s.

More often than not we are too preoccupied with the present to look to the future. I think it is important, however, to look for a moment at the past in order to put the present and the future in perspective.

Do you realize the view of history we have from the vantage point of today?

About a million years ago man first inhabited this earth. The Age of Man began.

About 5,000 years ago the Egyptians began developing farming implements from the crude sticks that had, by then, been used for some 2,000 years, and the Age of Agriculture began.

Hand tools were replaced only about 170 years ago with powered machinery, and the Industrial Age began.

The emergence of electronics about the turn of this century was a precursor to the Scientific Age which began as long as 60 years ago and as recently as 40 years ago, depending on which expert is making the assessment.

From the nearsighted vantage point of time now, it is difficult to tell what is happening to us currently, but I suspect that we have already entered into a transitional period from the Scientific Age into a new Age.

As I'm sure we all agree, this 1970 time period is one of turbulence. As a time of change, it is the seedbed for the 1980s. In a recent article, Dr. John R. Everett, President of New York City's New School for Social Research, had this to say about the decade we are beginning:

> "The fundamental parts of the Reformation-born myth structure have started to crumble. The pace will be accelerated in the '70s by a technology that feeds upon itself, a discontent that feeds upon uncertainty, a communications system that shows us what we are before we can understand what we have been, and a frantic awareness that many of our intellectual and moral emperors have no clothes.

Philip N. Whittaker is Assistant Secretary of the Air Force (Installations and Logistics). Previously he was Assistant Administrator for Industry Affairs, National Aeronautics and Space Administration. Before entering government service he was vice president of International Business Machines Corp.

> "From art to politics, from economics to family life, from religion to education and from love to hate, the institutional forms that define the bonds of the association of one American with another and with the world will be in increasingly rapid conflict during the '70s. The conflicts will be harsh and desperate. Never before has this nation approached a decade with such weakened faith in our religious and political institutions and our authority patterns. . . ."

These characteristics of the 1970s cause many problems in forecasting beyond the 1970s. Because of the turbulence, the waters are muddy and the vision unclear.

Change is occurring at an accelerating rate. You doubtless have seen charts showing the rate of change in our society based on speeds at which men travel, tool capacity, implements of combat, or one of a number of other such bases. They all start out gradually climbing until the present day when, in each case, the line goes almost straight up.

A plot of population growth follows the same pattern. For all time up to now, the world population has risen to some 3 billion people. In the next 30 years, this world population will double to 6 billion people. This means certainly that many more people are going to be older and younger. The social setting will be affected.

The increase in life span and the increased number of elderly will bring special problems of health care and the need to keep such people occupied and a contributing part of society.

The youth, on the other hand, bring vibrant, living problems. They question everything. Nothing is sacred. They certainly are questioning the wisdom, the processes and the responsiveness of Government and with even more fervor than is normally done every two and four years. The conscience and the motivations of business enterprise, especially big business, have been laid bare to the scrutiny of youth. Organized labor has come in for its share of criticism and debate. In fact, organized labor, the traditional revolutionary, has found that its act has been stolen by youth. Even religion is being challenged to a new reformation.

The *nature* of the *structure* of our *society* is becoming increasingly important. What ties it together—how? It might be compared with an electronic system with several circuits and many discretes. When you flip the switch to turn on the power, if it isn't put together correctly you begin to see smoke and maybe even a fire. We are getting short circuits in our social structure today, and the smoke is billowing up.

The economic situation plays its part in this unclear picture of the future. The financial trends have been inflationary, but will this continue? We see indications today in some industries—automotive, for example—that the public is resisting higher priced products.

The economic effect of the social turbulence mentioned a moment ago is a reasonably predictable thing. It will be inflationary and it will be diverting. The cost of protest and demonstration is high these days. You cannot budget for it and you end up spending funds planned for other uses. The purpose of the protest is to divert funds from one application to another—primarily from defense spending to social needs. Already the results of protest are being felt:

Spend less on the war!
Buy more equality!
Ban the bomb!
Bring in birth control!
Economy in Government!
Ecology for our earth!

These shifts are having their impact on the electronics industry with its close ties to military needs, and please understand, in cataloging these facts, I am not being judgmental.

All of the economic effects are not domestic. International trends contribute. The advent of supersonic intercontinental travel further reduces any need to restrict business ties to a limited geographic area. Already electronic components are being shipped from one continent to another for assembly. These finished products are then sold across much of the world. Engineering and design tasks have been moved across the oceans and so have the engineers and designers. Such actions are but the forerunners of future cooperation. The economic effect will be significant when such actions are routine.

Not only will the ease of international transport have its effect, but the whole international relations picture will, of course, greatly affect the 1980s. In his April 20th speech in New York, Secretary [of Defense] Laird warned that the Soviet Union could take the ICBM lead by the mid–1970s. The Chinese Peoples Republic has put up its first satellite. The United Arab Republic continues to accept more Soviet participation on the ground and in the air, the whole Mediterranean basin continues to be subjected to communist expansionism, and the Southeast Asia story is all-too-well known to all of us. As we look through this glass darkly it is obvious that the state of international relations will be a major determinant of the world of the decade of the 1980s.

What effect does technology have? And particularly electronics technology? Since the birth of electronics about 1900 and the beginning of the Scientific Age, technology has had an increasing role in our lives. If suddenly today all electrical and electronic equipment were to disappear, we would be a lost generation stumbling around in the dark.

With science reigning supreme for these last 50 or so years, we should be looking forward to a bright new technological world in which to live and enjoy life. The question is, "What is a bright new technological world worth?"

Now it is time to try to look through the haze in hopes of determining where we are going. As we look, it would help to settle in our minds that many of the characteristics of the 1980s are set. It used to be that pragmatic process led to sound decisions for the near term future. But that was when the pace was slower. Today, normal pragmatism does not reach far enough into the past, nor does it consider applications far enough into the future. We can, however, begin to bend the trends so that 20 or more years in the future, the results of our pressure will be significant—and maybe at least noticeable in 10 or 15 years.

Having assured you that you are more or less along for the ride at least through the 1970s, let me also propose that *the problems will be sociological rather than technological.* Masses of people caught up in the on-rushing cataract of science and things become lost as individuals. Individual human values are decreasing even in the face of many public and private endeavors to get back to the people. We see whole groups of people searching for identity. We have tremendous technological capability bred of the marriage of mother science and father competition, but we have too long neglected the personal human relationships.

Lest there are those among you that think we can solve this kind of dilemma by a healthy application of Uncle Sam's mighty dollar, let me say emphatically that increased budgets alone do not solve this problem!

The scope of social interests have expanded in our time. Social concerns are not now confined to classes of people or ethnic groups—nor even to regional or national boundaries. The scope is as round as the world. It is also not limited to people alone. The new buzz word is ecology. The reason so many are concerned about our environment is that we finally realize that stagnation and pollution do indeed affect people and that time is short.

All types of people are excited and want to do something for our ecology. Thousands of students demonstrated by at least walking to school on the recent Earth day. Just a few years ago no school had a course leading to a degree in ecology. Our ecologists at work today have not had the interdisciplinary training now considered essential. They were geologists or hydrologists or botanists.

One of the major requirements which will emerge as we enter the 10 years beyond this present decade will be to resolve the effective use of our available land. The wide open spaces are being filled in with houses, factories, apartments and office buildings, all interconnected with miles upon miles of paved roadways.

Land use challenges are not restricted to the urban and suburban locations although at present they are more critical there. As the metropolitan complexes grow and join and form into a joint megalopolis, rural lands will be overtaken. This includes farm lands and recreation lands, as well as privately owned land which many people feel is necessary to avoid population claustrophobia. It is heartening to note that some government agencies have valiantly been moving to acquire recreation land to preserve and protect it from encroachment. But more effort is needed.

The sociological problems of living by the mid-1980s with 50 percent more people will overshadow the technological surge which has now become our standard of living.

What will all this mean to the electronics community in our target decade? I want to divide the answer to that question into two parts—the challenges and the capabilities.

First, the challenges.

With little effort it is easy to see that the product opportunities will be much greater, and they will continue to grow. Never by the wildest imagination could we conceive of retreating from technological advance. Products unknown to us today and unneeded in this present world will be developed, produced and marketed and become useful and even necssary. These new products will mean more revenue for the industry and more jobs and income for the electronic and electrical engineers.

Another challenge will be the necessity of relating to the demanding social interests. The application of electronic technology to sociological needs will be an enforced diversification which will, in the long run, be healthy for the industry. In the Defense Department we have been preaching diversification to all of industry for a long time, because we could see the trends of tremendous industrial capacity with reduced military spending. For those who haven't already been thinking in this direction the pressure will force your planning to civilian markets.

I foresee opportunities for the electronics community to make major contributions to the world economy. The international market will continue to expand and production on a multi-national basis will include working agreements betwen independent companies, as well as the use of subsidiaries and franchises.

Probably one of the more significant challenges of the future is really at the door of the electronics industry. That is the opportunity to move into the role of the major systems prime contractor. Too long your industry has been relegated to the subcontractor role. With increasing demand on the use of electronics and with the overwhelmingly important part that electronics equipment is playing in major systems these days, it is time you opened the door and embrace this challenge. As you may know, the Air Force seriously considered reorienting the AWACS [Airborne Warning and Control System] program in December 1968 to use an electronics prime contractor. In that case the consideration grew out of a concern for lack of competition between the two airframe primes. Two reasons contributed to the decision to continue as planned. One reason was that real competition seemed to be available. Later events have proved this to be true. And the second reason was that only one electronics contractor queried offered to participate as a potential prime contractor. This offer was in spite of the fact that competition would be directly against airframe contractors from whom the electronics competitor would have to buy the airframe.

I look forward to the day when the electronics community takes this step —it may not be far off. It is our intention that the Advanced Airborne Command Post system will be competed on the basis of an electronic contractor becoming the prime.

Continuing with challenges of the 1980s, research and development has over the last several years increased in its share of program costs, while at the same time research and development budgets have declined. It seems to me that a certainty for the 1980s will be a continued increase in this direction, particularly for defense oriented work. The mind stretching needs of the time period beyond 1990 and the year 2000, when our world population reaches 6 billion, will challenge even the most capable of the research centers.

You can expect to see more need and involvement of the electronics community in the processes of educating new generations of workers. Revised educational procedures will become a challenge for cooperation between the educator and the electronics engineer. Relationships between the industry and the educational institutions will evolve around the need to provide a faster education and an education which will fit the graduate to multitudinous tasks.

Now for a few moments let me address the industry capabilities of the 1980s as I see them.

First, your industry will be developing equipments with functional requirements for the now unimaginable then. I believe that surely cybernetic applications will increase to the betterment of mankind. And one of the problems which the electronics community will help solve will be the education of people to accept and live in a machine environment.

Next, function speeds and equipment capacities will increase manyfold while equipment size will continue to reduce. We have wondered what there is beyond the miniaturized solid state circuitry. Perhaps some of you already know. I have seen demonstrations of some of the products of innovative thinking in this area and they are exciting.

A final development that I expect to observe in the 1980s will be increased and improved production capability coupled with improved production processing times thus resulting in reduced production costs. The reduction in production costs will have to continue to permit the needed increase in the research and development part of the cost pie. The civilian rather than the military customer will especially benefit from this capability.

Now, let us look at government participation as an influence in the electronics industry future. As I am sure you are aware, the military buyer has been the industry's single most influential customer. This is history—our role is now diminishing and, although I am sure that defense requirements will always be a major contributor to your support, other government participation will grow. In other words, the civilian need sector of Government will become more powerful and motivational in the trends of electronics development and production. One straw-in-the-wind which presages this shift is the prediction by someone that within 10 years the Health, Education and Welfare budget will exceed the Defense budget. Whether this turns out to be true or not, I am sure that HEW, along with Interior and Housing and Urban Development, will be among the major contributors.

This trend, of course, yields a diversified industry.

It is time now that I try to wrap up all these thoughts.

We started out with the Age of Man, the Agricultural Age, the Industrial Age and currently, the Scientific Age. My observation is that we have likely passed beyond the Scientific Age—only time will tell—and we are even now embarked on a new age which I would like to label the Societal Age. There are other possible names, of course, but I think Societal Age best describes the response to the needs and the goals of our turbulent times. We desire to be engaged in community life as a voluntary association of individuals with common aspirations.

"It all boils down to this," Martin Luther King Jr. said, "that all life is interrelated. We are all caught in an inescapable network of mutuality, tied into a single garment of destiny. Whatever affects one directly, affects all indirectly."

The challenges, as we look through this mirror darkly, seem to be exciting. The changing value systems which are sure to emerge constitute a revolution of considerable proportions. How we respond will depend on our willingness to accept our responsibilities for the future.

As for electrical and electronics engineers, in particular, the outlook is broader than it has ever been before. Whole new fields are opening. This will be true technologically as well as geographically. Opportunities for becoming a major element of the developing world-related market place will be yours. As Dwight Eisenhower once said, "Accomplishment will prove to be a journey—not a destination."

Aerospace Material: Old Friends or New?

Excerpt from a speech by Lt. Gen. John W. O'Neill, USAF, Vice Commander, Air Force Systems Command, to the 1970 Air Force Materials Symposium, Miami Beach, Fla., May 18, 1970.

In the Air Force, as never before in our history, we are finding it essential to push harder against the material and structural limits of our knowledge. We are forced to look over and beyond the horizon for new materials; new combinations; new structural concepts; and new methods of fabricating, testing, inspecting, and *predicting*.

But the overall problem is greatly compounded by two governing environmental conditions.

The first is the harsh physical environment in which our systems must now perform. We ask our new aircraft to fly higher and faster than ever before—in some cases at the fringes of space—and still be large enough to carry an effective combat payload over extended ranges. Yet we want them to be inconspicuous, if not invisible, to any means of detection. Beyond that, we often need to ask for high speed capability on the deck, adding a whole new set of material and structural demands. And we'd like all the extra power and maneuverability we can get, while consuming a minimum of fuel, to say nothing of good low speed, high lift performance so we can operate from small airfields, and the ruggedness and simple maintainability to go with more primitive strips.

Our missiles have to do incredible things under even worse conditions, with the added proviso that no humans will be aboard to make inflight

Lieutenant General John W. O'Neill, USAF, is Vice Commander of the Air Force Systems Command. He previously served as commander of AFSC's Space and Missile Systems Organization and Commander, Electronic Systems Division, AFSC. He holds a bachelors degree from Boston University, a masters degree from the University of Pittsburgh, and is a graduate of the Air War College.

corrections. They have to remain in place for years and then, within a minute's notice, perform at 100 percent.

With our spacecraft, finally, we simply combine the harshest requirements imposed on both aircraft and missiles. And the difficulties will be compounded as the Air Force and NASA jointly develop reusable boosters, shuttles and tugs for the space transportation system.

So we're really challenging every extreme of the physical environment: in temperatures, pressures, loads and exceedingly hostile phenomena—both natural and man-made.

Then we also face a second, hostile environment—the socio-economic climate within which we must pursue our military goals. For some time to come, we're going to have to accomplish our management tasks, our missions, our operations, our research and development, and our systems acquisitions with progressively diminishing resources. I think we have all begun to feel the pinch, but I suspect that it's only the beginning.

So the number of avenues we can explore is inevitably going to be curtailed. Thus, because we must be more *selective*, we likewise have to be much wiser in our choices of what to go forward with. It will require all the ingenuity we can muster to bring in the surviving systems on time, doing what they are supposed to, and—above all—remaining in the same dollar ball park they were conceived in.

This surely means that we *ourselves* must have greater confidence in new technology before we stake everything we have—or are likely to get—on it. By confidence in technology, I mean *proven demonstration in the configuration in which it will ultimately see service.*

That's why it's more than a mere coincidence that all the people manning our Air Force system program offices are hard to convince—that's the way we pick them. They have the prime responsibility for the programs they direct. And we have made it very clear to them just how deep that responsibility goes. So you really have to *show* them that any new technology is *ready* for any particular system they're in charge of.

This might seem like a way of keeping new technology out, but that's not really true. We have many types of advanced development programs to make sure that new technology is nurtured and encouraged. But what we need, in addition, is a more intimate, more frequent and more effective dialogue between the program managers and the laboratory people—both from AFSC laboratories and from industry.

We need to have more engineering and development people, those who are running the advanced development programs, spending time with the program managers, *demonstrating* a new method, material, or design concept—*and demonstrating it in terms of improved operational capability.*

I'm afraid we may also be a bit loose in the way we view and define the term "feasibility." Numerous things can be shown to be feasible in the laboratory, which is to say that they perform pretty much as visualized and conform to the laws of physics and chemistry. That, however, is often a long way from what a major program director has in mind when he thinks of feasibility. And the program director's view, tempered by the real world of finite dollars, must finally govern.

So, to the program people—and right on up to the Secretary of Defense—feasibility must include at least the following: rigorous predictability on fatigue and fracture parameters; complete understanding of the material/structural interface; fail-safe or fail-operational design; reliable test and inspection procedures; and quality control and ability assurance techniques for every step in the production process. And all this despite the fact that we probably will not have long production runs to bolster our confidence and broaden our statistical base.

The basic dichotomy was well illustrated at the Paris Air Show of 1965, when the USSR first displayed the AN–22. The designer of this very large transport, Oleg Antonov, was present at the show and answering questions. Western engineers asked him why, on such a new aircraft, he was using turboprop engines designed years before and used on several older Soviet aircraft. "Sometimes," Antonov replied, "it is better to have one old friend than two new ones."

This difficult path, between comfortable old friends who have proved their worth and fascinating new ones who are mostly unknown, is the one we are constantly traveling. Those who seek out and develop new technology have an obligation to fight for these "new friends," and to persuade the rest of us that it will be worth our while to exchange some of our trusted "old friends" for the new ones. In order to do so, they are going to have to do some thorough and exhaustive research on these new friends and make sure that they are very familiar with their backgrounds. In the light of social and budgetary pressures, and the fewer choices they portend, they will need more than unbridled enthusiasm to be convincing.

Which is not to say, by any means, that we will not continue to take the calculated risk; the very nature of the world and of our profession demands that we do. But we *will* insist upon being more certain than ever before that the calculations behind the risk are rigorous and precise.

That rigor and that precision—those are the challenges we face. Every material with which man has ever built, throughout his long and stormy history, was once locked in the ground. It took ideas—and hard work—to get them out, and to convert them into useful materials and artifacts. The pace of this progress has accelerated greatly over the past 20 years, and the curve will climb even more steeply in the years ahead. You are the people who will force the curve upward. With your knowledge, with your hard work, with your ideas, we will progress inevitably into the age of new and far better materials for Air Force aerospace applications.

WSMR Radar Complex Transferred to USAF

An Army White Sands Missile Range sensor complex, consisting of Target Tracking Radar (TTR–3) and Discrimination Radar (DR–1) in Launch Complex 38, has been transferred to the Air Force Range Measurement Laboratory (RML).

RML, an element of Patrick AFB, Fla., plans to update and modify the complex to advanced sensor status.

Total Air Force Research and Development Effort Assumed by AFSC

The Air Force has merged its primary basic research organization, the Office of Aerospace Research (OAR), with its principal applied research, development, test and acquisition agency, the Air Force Systems Command (AFSC). The consolidation became effective on July 1. Thus AFSC is now responsible for the entire research and development spectrum—from an innovative idea in the mind of an Air Force or contract scientist, until a "new generation" piece of hardware or scientific improvement has finished its tests and evaluation and is handed over to the using command.

Joining the Air Force's two research commands to foster a total environment even more conducive to high quality research had been under study for several years. However, it was recognized that great care would have to be taken to ensure that visibility of research was maintained, and that the basic research function would continue to receive the leadership and management attention it had in the past.

Among the objectives of the merger, agreed upon by the Secretary of the Air Force, the Assistant Secretary of the Air Force (Research and Development), and the Commanders of AFSC and OAR, are:

- Improvements resulting in a strong research program of greater value to the Air Force.
- Total environment conducive to high quality research activities (as distinct from development).
- Maintenance of visibility of research at the Office of the Secretary of the Air Force.
- Continued management sensitivity to the nature of universities and the research they conduct.
- Continued operation of the major laboratories of OAR as separate entities at their present locations.
- Preservation of certain OAR policies and procedures which have demonstrated their worth, such as the procurement of research with universities and the Management and Scientific Information System (MASIS), a centralized computer system.
- Application of management advances to the AFSC Directorate of Laboratories and vice versa.
- Continued reasonable freedom of action and freedom from detailed direction for creative researchers.
- Conduct of research with a greater awareness of present and future operational needs of the Air Force.
- Effecting reasonable economies in recognition of the austere budgets facing the Air Force, although the primary purpose of the merger was not cost reduction.
- Minimizing disruptive impacts in placing civilian personnel.

Field installations of the Office of Aerospace Research were kept intact. Personnel of OAR's headquarters at 1400 Wilson Blvd., Arlington, Va., were absorbed into AFSC's headquarters and moved to Andrews AFB, Md. The Office of Scientific Research—a former subordinate element of OAR—will continue to operate at the Arlington address as a self-sufficient unit.

Fifty-nine of the individuals who moved to AFSC headquarters are now assigned to the Command's Director of Laboratories (DOL). DOL will now supervise the four former OAR laboratories in addition to the nine already under its jurisdiction. Another 80 people joined AFSC offices and directorates to do work parallel to that they had done at OAR.

Major General Paul T. Cooper

What OAR Brought to AFSC

The Office of Aerospace Research grew out of the pre-existing Air Force Office of Scientific Research (which it retained as a major subordinate element) and was organized as a separate Air Force operating agency with major command status on April 1, 1961.

Its mission was to perform and support relevant research for maintaining present and future Air Force superiority; to conduct a portion of the Air Force's exploratory research in space; and to provide research results to governmental and non-governmental research and development agencies for their use in improving aerospace technology, weapons, equipment, and operations.

OAR conducted research for the Air Force through its own laboratories; through an extensive contracts and grants program with colleges, universities, individuals and private industry; and through space experiments. Its research endeavors were grouped into the four general areas of physical, engineering, environmental, and life sciences.

OAR mission and research efforts continue uninterrupted at the four laboratories and other support functions which OAR brought to AFSC in the merger. The former OAR laboratories are:

Air Force Office of Scientific Research (OSR). This is the primary Air Force agency for supporting extramural basic research in nuclear and general physics, chemistry, mathematics, electronics, mechanics, energy conversion, astronomy and astrophysics, and the terrestrial, behavioral and information sciences. Quality, rather than quantity, is the objective. The program is directed toward creating new knowledge needed to evolve future technologies for the Air Force, and to assist development efforts in solving technical problems.

OSR selects research for support

from unsolicited proposals which are evaluated by its project scientists on the basis of originality, scientific significance, scientific competence of the investigator, and applicability to Air Force requirements. It carries out its research program through more than 1,200 grants and contracts with approximately 200 colleges, universities, individuals, and research organizations in the United States, Canada, Europe, South America, Australia, Africa, and Asia.

Air Force Cambridge Research Laboratories (CRL). Formerly OAR's largest subordinate unit, the Air Force Cambridge Research Laboratories at L. G. Hanscom Field, Mass., have both a research and exploratory development mission. A complex of 10 separate laboratories, CRL concentrates on research in geophysics. The exploratory development mission falls in the area of the environmental sciences, which include terrestrial and atmospheric sciences, astronomy, and astrophysics.

The 10 CRL laboratories use the most advanced equipment for such endeavors as infrared, radio astronomy, and balloon research. Their fields of research are principally in the areas of data sciences, microwave physics, aerospace instrumentation, meteorology, space physics, terrestrial sciences, optical physics, aeronomy, ionospheric physics, and solid state sciences.

CRL manages so-called "operating locations" at Thule Air Base, Greenland, Catalina, Ariz., Sacramento Peak, N.M., Patrick AFB, Fla., Vandenberg AFB and Chico, Calif., and Holloman AFB, N.M., for work in communications propagation, radar and radio astronomy, balloon research, and other areas. The Sacramento Peak Observatory at Sunspot, N.M., is one of the largest CRL sites and is a leading facility for studying solar activity.

Scientists at CRL each year instrument more than 50 large research rockets for launch from the White Sands Missile Range, N.M., and Wallops Island, Va. In addition, CRL designs special payloads for Air Force and NASA satellites. Several highly instrumented "flying laboratories"—C–135 and C–130 aircraft—are also used by CRL scientists to study atmospheric densities, pressures and temperatures.

Aerospace Research Laboratories (ARL). The second largest subordinate unit was the Aerospace Research Laboratories at Wright-Patterson AFB, Ohio. Its research is largely in the physical and engineering sciences. It maintains 10 separate laboratories doing research in chemistry, metallurgy and ceramics, general physics, fluid dynamics facilities, applied mathematics, plasma physics, thermomechanics, solid state physics, hypersonics, and energetics.

ARL has one of the nation's leading wind tunnel facilities. It is used to test aerodynamic designs, materials, and models. The laboratories are pacesetters in such fields as supersonic combustion, electrofluid dynamic energy conversion, dust particle separation, rare earth studies, and low and high energy density plasmas.

Frank J. Seiler Research Laboratory. Newest and smallest of the former OAR laboratories is the Frank J. Seiler Laboratory, an inhouse laboratory located at the Air Force Academy, near Colorado Springs, Colo. Dedicated in October 1963, its staff conducts research in chemistry, applied mathematics, and aerospace mechanics. Its mission also includes promoting, encouraging, and supporting academy faculty and cadet research, and providing computer support for the academic program. Hopefully, this laboratory will stimulate interested cadets to enter the research field.

Other Activities

Office of Research Analyses (ORA). Envisioning the requirements of the world 10 to 50 years in the future, scientists and technicians of OAR's former Detachment 8, Office of Research Analyses (now redesignated as AFSC's Detachment 37, Office of Research Analyses) evaluate proposed weapon systems and aerospace projects to determine their value in the changing world.

Generally, the mission of ORA is to relate Air Force research activities to operational requirements. Serving as a marketing facility for the Air Force Systems Command, ORA, through systems analyses, keeps other agencies advised of research accomplished. ORA provides cost estimates for future weapons systems development and future operating costs. Examples of ORA studies in the past are defensive and offensive strategies, military space launch systems, ballistic missile defense systems, and the prediction of solar activity in connection with manned space flight.

The Office of Research Analyses is now under the operational control of AFSC's Deputy Chief of Staff for Development Plans.

European Office of Aerospace Research (EOAR). During the last 25 years many technological contributions from foreign scientists have been of direct value to the U.S. Air Force. During this time a good percentage of the new ideas leading to basic theoretical progress, particularly in the atomic sciences, was sparked by foreign scientists, primarily European, or by scientists trained abroad. For most of this period the Air Force has been engaged in cooperative research with European nations and other countries of the free world. Work with foreign scientists has developed a mutual working base aimed at technological advancement.

In order to facilitate the flow of scientific information from the foreign scientific community to the Air Force scientists, and to foster and strengthen their intercommunication, EOAR maintains an office in London, England, to manage the Air Force's foreign research activities in Free Europe, the Near East, the Middle East (including India, Burma and Ceylon) and Africa. Air Force foreign research activities in Canada, Australia, New Zealand and South America are administered directly by Air Force agencies in the United States. In the Far East, procurement of foreign research for the Air Force is handled by the Army's research office in that area.

The European Office of Aerospace Research screens foreign research and exploratory development proposals and then forwards them to appropriate laboratories in the United States for evaluation.

Management and Scientific Information System. Several thousand scientists at several hundred government, academic, industrial and private laboratories do basic research for

(Continued inside back cover)

Status of ASPR Committee Cases

The following is a listing (revised as of June 1, 1970) of the cases currently under consideration by the Armed Services Procurement Regulation (ASPR) Committee, of the Office of the Assistant Secretary of Defense (Installations and Logistics).

On items marked by asterisks, the text has been omitted to shorten the listing. The asterisks denote actions taken as shown below:

*—Case closed, no ASPR revisions resulting.

**—Case closed, approved for printing in a subsequent ASPR revision.

***—Case closed, approved for printing subject to further government coordination.

The listing includes subjects of interest to contractors but excludes cases of a minor or editorial nature, those considered "sensitive," and those involving a deviation from the regulation which are processed by the ASPR Committee.

The ASPR Committee meets with representatives of major industry associations periodically to explain the purpose and status of each of the cases under consideration, and to answer questions from industry representatives concerning the cases. All proposed ASPR changes of major policy are forwarded to industry associations in draft form for the review and comments of the association memberships. Industry comments are evaluated by the Defense Department before a final decision on the proposal is made by the ASPR Committee.

Communications Services. Development of uniform ASPR coverage which would permit deletion of existing departmental coverage with respect to procurement of communication services from both regulated and unregulated suppliers. Industry comments have been received, considered, and revised coverage developed. Comments from the Office of the Director, Telecommunications Management, and the Federal Communications Commission have been received and are under consideration.

Advance Understandings of Allowability, ASPR 15–107. To revise the existing ASPR paragraph to explicitly provide that such agreements must be in writing to be binding on the Government. Proposed ASPR coverage concerning Advance Understandings on Particular Cost Items was forwarded to industry for comment on May 29, 1968. Final action on this case has been deferred pending completion of the committee's consideration of case on the corporate administrative contracting officer.

Revisions to ASPR 15–205, Cost Principles on Bid and Proposal and Independent Research and Development. The proposed revisions to the existing ASPR cost principles on Independent Research and Development and Bid and Proposals were developed as a staff action outside of the ASPR Committee and referred to the committee for editing and the obtaining of industry comments. This material was forwarded to industry on Jan. 29, 1968. On March 25, 1968, the reporting date for submission of comments by industry and government agencies was extended to June 30, 1968. Industry comments have been received. The subject case is still under study.

Clauses for Service Contracts. To develop a new part for ASPR Section VII to cover service contracts generally, incorporating by reference, to the extent feasible, the fixed-price and cost-reimbursement clauses contained in Parts 1 and 2 of Section VII. This matter is still under development.

Proposed ASPR 9–203(f) Clause, Rights in Technical Data—For RDT&E and Acquisition Contracts for Major Systems and Subsystems. To consider modifying the ASPR policy concerning rights in technical data insofar as research, development, test and evaluation (RDT&E) and acquisition contracts for major systems and subsystems are concerned, by prescribing a special clause for inclusion in prime major systems and prime subsystems RDT&E contracts which would require the contractor to permit subcontractors to sell subcontractor fabricated parts or services directly to the Government without the payment of license fees or other inhibition not withstanding that such subcontractor effort may require the use of limited rights data furnished by the prime contractor. Consideration of the coverage in this area was delayed awaiting receipt of comments from CODSIA. Proposed coverage was forwarded to industry for comment on March 31, 1970.

***Mandatory Application of ASPR Cost Principles in Fixed-Price Contracts.*

Delinquent Delivery Schedules on Other Than Cost-Reimbursement Type Supply and Service Contracts. To modify various provisions of Section VII, Part 6, to clarify the rights and obligations of both parties in the event of delinquent performance. The proposed revisions were forwarded to industry for comment on March 3, 1969. Industry comments have been received. This matter is still under consideration.

**Transfer of Materials Between Contracts.*

Termination—Deferring Determination Whether for Default or Convenience Clause. To consider whether an ASPR clause embodying the subject concept should be developed for inclusion in the regulation. Such a clause, half-way between the present ASPR Default clause and the present ASPR Termination for Convenience of the Government clause would permit termination of a contract while deferring the contracting officer's decision as to whether (a) the contract is in default; or (b) termination should be for convenience of the Government. To also consider whether the Stop Work Order clause should be modified to authorize conversion of a stop work order to a termination for default as well as a termination for convenience as is now provided. This item was forwarded to industry for comment on July 18, 1969. The date for receipt of comments was extended to Oct. 6. Industry and government comments are still under consideration.

Conflict of Interest Clause. To consider whether further guidance in the regulation and appropriate contractual safeguards should be provided to avoid conflicts of interest which may be occasioned by acquisitions and mergers involving systems engineering contracts. This item was forwarded to industry for comment on July 8, 1969. Comments have been received and are currently under study.

ASPR Section IX, Part 2. To consider whether amendments to Section IX, Part 2, and other pertinent ASPR sections are necessary in view of the re-issued DOD Instruction 5010.12, dated Dec. 5, 1968, entitled "Management of Technical Data." The changes developed under this case will be forwarded to industry for comment in the near future.

***Construction Warranty Clause, ASPR 1–324.10.*

***Location Allowances at Unfavorable Locations.*

Verification of Catalog or Market Price Exceptions Under Public Law 87–653. To consider the recommendation of the GAO that ASPR be revised (a) to require contractors to submit sales data of recent commercial sales for approximately similar quantities, of the proposed purchase by the Government, prior to acceptance by the Government of a catalog or market price, and (b) to further provide that contracting officers be required to verify the sales data submitted by contractors. The proposed coverage and a new Form 633 were forwarded to industry for comment on Sept. 29, 1969. Industry and government agency comments have been received, and are under consideration.

Health and Safety Clauses. To review and present recommended changes concerning the applicability of the Health and Safety clauses currently prescribed in 7–104.78, .79, and .80, in light of the comments on this matter received from CODSIA. Revised ASPR coverage was forwarded to industry on Sept. 2, 1969. Comments have been received and are under consideration.

Revision of ASPR B–311, C–311, and S3–603. To make necessary revisions to Appendix B–311 and Appendix C–311 and Supplement 3 to provide for uniform reporting by contractors of government property. Revisions to DD Form 1662 are included in the case and the proposed coverage is under consideration.

**Financial Accounting for Government-Owned Facilities.*

Single-Service Management of Industrial Facilities. To develop procedures which will provide that only one contract authorizing use of government facilities will be in effect at any one location. It is intended that contracts which authorize the acquisition or furnishing of government facilities will provide for the automatic transfer of those facilities to the "use" contract upon receipt of installation. The subcommittee reporting date has been extended to June 1, 1970.

Corporate Administrative Contracting Officer Program. To provide for the appointment of a single corporate administrative contracting officer to act, in the case of multiplant companies, on matters which have corporate-wide application. The corporate administrative contracting officer will not act on matters having only local application. These matters will continue to be received by the plant administrative contracting officer. This matter is now under consideration by higher authority.

Bailment of Government Property to Contractors. To consider the development of proposed ASPR coverage including definition and policy with respect to bailment of government property to a contractor as well as to the development and publication of a standard ASPR format of bailment agreement for DOD-wide use. This matter is currently being studied.

ASPR 15–205.6(f), Deferred Compensation. To clarify ASPR 15-205.6(f) covering deferred compensation in light of the questions raised concerning: (a) whether deductibility for Federal income tax purposes is a prerequisite to allowability for contract cost purposes; (b) the extent to which actuarial gains and losses (including unrealized market appreciation and depreciation) must be taken into account in determining costs; (c) whether the cost of improvements in benefits to retired employees is allowable; (d) whether pay-as-you-go pension payments are allowable; and (e) whether contributions of interest equivalents or unfunded pension liabilities are allowable. This item was forwarded to industry for comment on July 8, 1969. Industry and government agency comments have been received and considered. This matter is now being considered by higher authority as a matter involving major policy.

***Limitation of Costs, ASPR 7–203.3, Limitation of Funds, ASPR 7.402.2.*

ASPR Coverage for Training and Educational Costs. To consider the necessity for revising 15–205.44 in light of internal and external correspondence indicating (a) the need for supplemental guidance to cover cost of attendance of contractor employees at specialized courses, such as those conducted by the Harvard Graduate School of Business Administration; (b) to allow part-time education related to "company area of interest in the field where the employee is now working or may reasonably be expected to be employed;" (c) liberalization of the 156 hours per year limitation on part-time education; (d) relaxation of the one-year limitation for full-time graduate or post-graduate study and allowing education for other than engineering and scientific purposes; (e) allowing "matching payments;" and (f) to consider the feasibility of allowing all reasonable training and educational costs. Proposed coverage was forwarded to industry and other government agencies for comment on Jan. 6, 1970. Comments have been received and are currently under study.

Forward Pricing Rate Agreements. To consider the desirability of providing ASPR coverage with respect to forward pricing rate agreements covering (a) definition, (b) establishment, (c) use, and (d) procedures, as well as the relationship of such agreements to contracts subject to the requirements of Public Law 87–653. Proposed coverage has been developed and was forwarded to industry for comment on Oct. 30, 1969. Comments have been received and are under consideration.

Clarification of Application of CWAS to Limitations Contained in the Cost Principles. To consider the need of clarifying the application of Contractor's Weighted Average Share (CWAS) to specified restrictions or exclusions contained in the cost principles, as well as the correction of any errors in the CWAS designations. The proposed revisions were forwarded to industry for comment on Nov. 18, 1969. Comments have been received and are under consideration.

Warranties—Consequential Damages. To develop Department of Defense policy and appropriate ASPR coverage for contractual warranties expressed and implied relating to latent and patent defects, as well as consequential damages. This assignment involves not only consideration of the expressed or implied warranties under the Inspection clause, but further includes consideration of whether specific contractual provisions should be developed to cover these areas. This matter is still under consideration.

Severance Pay to Employees on Support Service Contracts. To consider whether ASPR 15–107 "Advance Understandings on Particular Cost Items" should be expanded to explicitly cover severance pay when support service contracts are replaced, particularly with respect to payment to employees whose employment with the phasing-out contractor is severed but who maintain continuity of employment and credit for seniority with the follow-on contractor. Additional clarifying language has been developed by the committee and concurred in for the purpose of obtaining industry comments. Industry comments have been received and are under consideration.

***Negotiated Overhead Rates Clause.*

Late Proposals and Modifications in Negotiated Procurements. To consider revising 3–506 covering late proposals and modifications thereof in negotiated procurements in light of the numerous General Accounting Office decisions in this area. This matter is still under study.

Omnibus GAO and DOD Audit Clauses. To consider the feasibility of developing an omnibus General Accounting Office Examination of Records clause and an omnibus DOD Audit clause to replace the existing Examination of Records clauses and numerous DOD Audit Clauses. The development of a single Examination of Records clause has been undertaken in conjunction with representatives of the General Accounting Office. Similarly, a draft of a proposed single DOD Audit clause has been developed. The new clauses were forwarded to industry for comment on Jan. 20, 1970. Industry and government agency comments have been received and are under consideration.

Evaluation Criteria. To undertake the development of additional guidance of evaluation criteria to be included in solicitations, thus giving effect to numerous General Accounting Office decisions that prospective offerors should be advised of the relative importance to be attached to each evaluation factor. This matter is still under study.

Revision of Billing Prices Under Incentive Contracts and Price Redetermination Contracts. To review the ASPR 7–108 Incentive Price Revision and the 7–109 Price Redetermination clauses and to recommend changes therein to permit upward adjustment of billing prices to conform to the policy in ASPR 3–404(a)(4). The military services have been authorized to deviate from the restrictions of the clauses pending the issuance of revised clauses which are currently being developed.

Pricing of Indefinite Delivery Type Contracts. To consider revising ASPR 3–409 to modify the restriction that indefinite delivery type contracts must provide for (a) firm fixed prices, (b) price escalation, or (c) price redetermination, by allowing pricing on the basis of common manufacturers' price lists or industry pricing guides. This matter is presently under study.

Contractor Procurement System Review (CPSR). To consider expanding existing ASPR coverage on CPSRs and consent to subcontract provisions to provide more detailed guidance. A report on this subject will be considered in the near future.

Time Extensions. To consider the inclusion of a Time Extensions clause in construction contracts in which liquidated damages are included. A clause clarifying the existing rights of the Government under the clauses set forth in ASPR 7–602.5 "Termination for Default—Damages for Delay—Time Extensions" and ASPR 7–602.3 "Changes" (Feb. 1968 version), to extend the time for completion of work when a contractor is delayed by any of certain enumerated excusable delays, was forwarded to industry for comment on March 23, 1970.

Proposed Revision of ASPR Appendix I. To consider if Appendix I requires changes to make it compatible with Military Standard Contract Administration Procedures (MILSCAP)/departmental/contract administration office and consignee requirements. A report on this subject will be considered in the near future.

Wage and Price Escalation. To review existing ASPR escalation provisions to determine the advisability of developing additional wage and material price escalation clauses for use in contracts for complex weapon systems to be produced over an extended period of time. Clauses developed by a special study group established to review this subject were forwarded to industry for comment May 18, 1970.

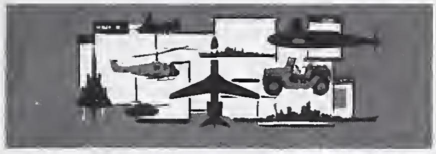
Proposed Change to ASPR 15–205.16, Insurance and Indemnification. To consider a suggestion that ASPR 15–205.16 be revised to specifically limit allowable costs of self-insurance for future liabilities to an amount determined on a present value basis. A report on this matter will be considered in the near future.

Allocation of Contractors' Cost for Special Facilities. To consider additions or revisions to Section XV to clarify cost allocation procedures under 15–201.4 in general, and allocation of the costs of special facilities such as wind tunnels, in particular. This matter currently is under study.

Capital Data Employed. To consider the advisability of initiating a policy change to use capital-employed as a factor in developing prenegotiation profit objectives. This matter has been assigned to a specially selected subcommittee and currently is under study.

Military Sealift Command

The Military Sea Transportation Service has been renamed Military Sealift Command. Vice Admiral Arthur B. Gralla is Commanding Officer. Offices are at 3800 Newark NW, Washington, D.C.



DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of June 1970.

DEFENSE SUPPLY AGENCY

2—The following contracts were awarded by the Defense Fuel Supply Center, Alexandria, Va., for JP–5 jet fuel:

Carson Oil Co., Los Angeles, Calif. $3,576,100. 30,240,000 gallons. DSA 600–70–D–1591.

Coastal States Petrochemical Co., Houston, Tex. $5,942,926. 55,083,200 gallons. DSA 600–70–D-1592.

Fletcher Oil and Refining Co., Carson, Calif. $1,588,260. 13,500,000 gallons. DSA 600–70–D–1594.

Gulf Oil Co., Houston, Tex. $4,031,160. 42,000,000 gallons. DSA 600–70–D–1597.

Humble Oil and Refining Co., Houston, Tex. $10,099,763. 100,790,000 gallons. DSA 600–70–D–1599.

Phillips Petroleum Co., Bartlesville, Okla. $2,072,592. 17,760,000 gallons. DSA 600–70–D–1604.

Powerine Oil Co., Santa Fe Springs, Calif. $2,891,001. 25,000,000 gallons. DSA 600–70–D–1605.

Sun Oil Co., Philadelphia, Pa. $1,103,000. 10,000,000 gallons. DSA 600–70–D–1607.

Tenneco Oil Co., Houston, Tex. $1,918,000. 20,000,000 gallons. DSA 600–70–D–1608.

Union Oil Co. of Calif., Los Angeles, Calif. $1,802,170. 15,456,000 gallons. DSA 600–70–D–1610.

U.S. Oil and Refining Co., Tacoma, Wash. $1,128,452. 9,438,000 gallons. DSA 600–70–D–1611.

—The following contracts were awarded by the Defense Fuel Supply Center for JP–4 jet fuel:

Famariss Oil and Refining Co., Hobbs, N.M. $1,225,832. 10,800,000 gallons. DSA 600–70–D–1611.

Fletcher Oil and Refining Co., Carson, Calif. $2,416,758. 22,500,000 gallons. DSA 600–70–D–1643.

Fort Worth Refining Co., Fort Worth, Tex. $2,996,534. 28,450,000 gallons. DSA 600–70–D–644.

Getty Oil Co., New York, N.Y. $3,898,777. 38,640,000 gallons. DSA 600–70–D–1645.

Gulf Oil Co., Houston, Tex. $1,290,420. 11,970,000 gallons. DSA 600–70–D–1648.

Hercules Oil Co. of San Diego, Inc., Long Beach, Calif. $1,420,312. 11,950,000 gallons. DSA 600–70–D–1649.

Amerada Hess Corp., Woodbridge, N.J. $1,238,334. 12,364,800 gallons. DSA 600–70–D–1650.

Howell Refining Co., San Antonio, Tex. $2,396,569. 23,000,000 gallons. DSA 600–70–D–1652.

Humble Oil and Refining Co., Houston, Tex. $17,068,259. 174,515,000 gallons. DSA 600–70–D–1653.

Husky Oil Co. of Delaware, Denver, Colo. $1,095,283. 10,420,000 gallons. DSA 600–70–D–1655.

Kern County Refinery, Inc., Los Angeles, Calif. $3,848,555. 33,614,324 gallons. DSA 600–70–D–1657.

MacMillan Ring-Free Oil Co., Inc., Los Angeles, Calif. $3,349,191. 30,000,000 gallons. DSA 600–70–D–1663.

Continental Oil Co., Houston, Tex. $2,800,651. 26,000,000 gallons. DSA 600–70–D–1634.

Crystal Flash Petroleum Corp., Indianapolis, Ind. $1,100,170. 9,830,000 gallons. DSA 600–70–D–1635.

Delta Refining Co., Memphis, Tenn. $4,167,936. 40,470,000 gallons. DSA 600–70–D–1636.

Edgington Oil Co., Long Beach, Calif. $2,132,904. 19,580,000 gallons. DSA 600–70–D–1639.

Mobil Oil Corp., New York, N.Y. $12,245,535. 124,028,024 gallons. DSA 600–70–D–1666.

Monarch Refining Co., Div. of Wing Corp., San Antonio, Tex. $1,408,749. 13,000,000 gallons. DSA 600–70–D–1667.

Navajo Refining Co., Artesia, N.M. $3,297,343. 31,000,000 gallons. DSA 600–70–D–1668.

Okmulgee Refining Co., Inc., Olkmulgee, Okla. $6,913,194. 72,020,000 gallons. DSA 600–70–D–1670.

Phillips Petroleum Co., Bartlesville, Okla. $7,529,251. 71,870,000 gallons. DSA 600–70–D–1674.

Adobe Refining Co., La Blanca, Tex. $1,350,807. 12,320,000 gallons. DSA 600–70–D–1612.

American Oil Co., Chicago, Ill. $4,067,486. 38,040,000 gallons. DSA 600–70–D–1615.

Americana Petrofina Co. of Texas, Dallas, Tex. $2,203,552. 20,800,000 gallons. DSA 600–70–D–1616.

Ashland Oil Inc., Ashland, Ky. $4,891,149. 47,722,000 gallons. DSA 600–70–D–1618.

Atlantic Richfield Co., Chicago, Ill, $2,101,681. 23,064,000 gallons. DSA 600–70–D–1620.

Atlantic Richfield Co., Los Angeles, Calif. $2,907,451. 27,300,000 gallons. DSA 600–70–D–1621.

Atlantic Richfield Co., Philadelphia, Pa. $1,234,145. 11,810,000 gallons. DSA 600–70–D–1622.

Bayou Refining Co., Inc., Pasadena, Tex. $1,217,853. 11,900,000 gallons. DSA 600–70–D–1623.

Carson Oil Co., Los Angeles, Calif. $4,267,121. 38,640,000 gallons. DSA 600–70–D–1627.

Chevron Oil Co., Denver, Colo. $7,940,954. 77,138,000 gallons. DSA 600–70–1629,

Cities Service Oil Co., New York, N.Y. $1,518,938. 16,800,000 gallons. DSA 600–70–D–1630.

Coastal States Petrochemical Co., Houston, Tex. $3,786,824. 38,135,200 gallons. DSA 600–70–1632.

Powerine Oil Co., Santa Fe Springs, Calif. $1,667,671. 15,580,000 gallons. DSA 600–70–D–1675.

Pride Refining, Inc., Abilene, Tex. $1,824,332. 16,500,000 gallons. DSA 600–70–D–1676.

Signal Oil and Gas Co., Houston, Tex. $1,405,530. 15,456,000 gallons. DSA 600–70–D–1678.

Southland Oil Co., Div. of Vermont Gas Systems Inc., Yazoo City, Miss. $1,191,482. 12,000,000 gallons. DSA 600–70–D–1679.

Southwestern Pallet Co., Abilene, Tex. $3,328,219. 34,000,000 gallons. DSA 600–70D–1681.

Standard Oil Co. of Calif., San Francisco, Calif. $17,550,466. 166,152,000 gallons. DSA 600–70–D–1682.

Sun Oil Co., Philadelphia, Pa. $9,564,414. 94,140,000 gallons. DSA 600–70–D–1683.

Tesora Petroleum Corp., San Antonio, Tex. $5,140,090. 44,190,000 gallons. DSA 600–70–D–1684.

Tesoro-Alaskan Corp., San Antonio, Tex. $7,299,540. 58,680,000 gallons. DSA 600–70–D–1685.

Texaco Inc., Long Island City, N.Y. $3,719,474. 39,441,888 gallons. DSA 600–70–1686.

Tonkawa Refining Co., Houston, Tex. $2,421,592. 23,180,000 gallons. DSA 600–70–D–1687.

Toscopetro Corp., Bakersfield, Calif. $1,383,886. 12,500,000 gallons. DSA 600–70–D–1688.

Triangle Refineries, Inc., Houston, Tex. $1,798,345. 17,000,000 gallons. DSA 600–70–D–1689.

—**Harnischfeger Corp.,** Milwaukee, Wis. $9,467,273. 20-ton cranes, shovel fronts and associated maintenance/repair data. Escanaba, Mich., and Scarborough, Ontario, Canada. Defense Construction Supply Center, Columbus, Ohio. DSA 700–70–C–9505.

3—**Page Airways, Inc.,** Rochester, N.Y. $1,096,221 (contract modification). Operation and maintenance of the Defense Industrial Plant Facility, Atchison, Kan., for FY 1971. Defense Industrial Plant Equipment Center, Memphis, Tenn. DSA 200–68–C–0002–P00050.

—**Rebmar, Inc.,** Corozal, Puerto Rico, $1,065,091. Rucksacks. Morovis, Puerto Rico. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–70–C–1923.

—**Trenton Textile Engineering and Manufacturing Co., Inc.,** Trenton, N.J. $2,751,548. 398,198 wet-weather ponchos for the Army. Dover, Del., and Trenton. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–70–C–1943.

4—The Defense Fuel Supply Center, Alexandria, Va., issued the following contracts for fuel oil and gasoline:

Olympia Oil and Wood Products Co., Olympia, Wash. $2,518,207. DSA 600–70–D–1810.

Western Operations, Inc., Standard Oil Co. of Calif., San Francisco, Calif. $1,546,453. DSA–600–70–D–1840.

5—**The Sportwelt Shoe Co.,** Nashua, N.H. $1,309,730. 416,000 pairs of tropical combat boots. Grafton, Sullivan and Hillsboro counties, N.H. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–70–C–1954.

8—**Sinclair Caribbean Oil Co., of Atlantic Richfield Co.,** New York, N.Y. $2,190,913. 23,900,000 gallons of JP–4 jet fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600–70–D–1721.

—**Bata Shoe Co., Inc.,** Belcamp, Md. $3,508,859. 103,130 pairs of insulated boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–70–C–1897.

9—**Drexel Dynamics Corp.,** Horsham, Pa. $1,326,312. 234 electric fork lift trucks. Defense General Supply Center, Richmond, Va. DSA 400–70–C–4610.

—**Western Operations, Inc., Standard Oil Co. of Calif.,** San Francisco, Calif. $1,491,169. 7,333,700 gallons of petroleum products for use in Alaska. Defense Fuel Supply Center, Alexandria, Va. DSA 600–70–D–1864.

10—**Island Creek Coal Sales Co.,** Cleveland, Ohio, $2,467,925. 245,500 net tons of bituminous coal for General Services Administration. Coal Mountain and Amherstdale, W. Va. Defense Fuel Supply Center, Alexandria, Va. DSA 600–70–D–0195.

—**Southern Packaging and Storage Co., Inc.,** Greeneville, Tenn. $1,305,482. 1,742,967 cases of individual combat meals. Mullins,

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company — Value — Material or Work to be Performed—Location of Work Performed (if other than company plant) — Contracting Agency—Contract Number.

S.C. Defense Personnel Support Center, Phildelphia, Pa. DSA 13H-70-C-S504.

11—**Hyster Co., Portland, Ore.** $1,087,685. 96 fork lift trucks, 15,000 pound capacity. Danville, Ill. Defense Construction Supply Center, Columbus, Ohio. DSA 700-70-C-9360.

—**Usibelli Coal Mine, Inc.,** Usibelli, Alaska. $2,435,895. 350,000 net tons of bituminous coal. Suntrana, Alaska. Defense Fuel Supply Center, Alexandria, Va. DSA 600-70-D 1500.

16—**Trenton Textile Engineering and Manufacturing Co., Inc.,** Trenton, N.J. $1,358,298 (contract modification). Army ponchos. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-70-C-1943.

18—The Defense Personnel Support Center, Phildelphia, Pa., issued the following contracts for men's oxford dress shoes:

Genesco, Inc., Nashville, Tenn. $1,373,521. 208,000 pairs. Tullahoma, Tenn., and Huntsville, Ala. DSA 100-70-C-2015.

Endicott Johnson Corp., Endicott, N.Y. $1,583,591. 239,342 pairs. DSA 100-70-C-2014.

—**Saulk Valley Manufacturing Co.,** Oakland, Calif. $1,480,696 (contract modification). 117,645 spools of barbed wire. Defense Construction Supply Center, Columbus, Ohio. DSA 700-70-C-A080.

19—**Little Giant Crane and Shovel, Inc.,** Des Moines, Iowa. $3,960,982. 92 truck-mounted cranes, 20-ton capacity. Defense Construction Supply Center, Columbus, Ohio. DSA 700-70-C-8940.

23—**Island Creek Coal Sales Co.,** Cleveland, Ohio. $1,481,700. 132,000 net tons of bituminous coal. Stowe, W. Va. Defense Fuel Supply Center, Alexandria, Va. DSA 600-70-D-1511.

25—**Tan-Tex Industries Corp.,** New York, N.Y. $1,262,190. 1,661,000 linear yards of navy shade 3359 twill cloth. Lexington, N.C., and Westerly, R.I. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-70-C-2057.

—The Defense Construction Supply Center, Columbus, Ohio, issued the following contracts:

Hyster Co., Portland, Ore. $1,460,687. 297 fork-lift trucks. Danville, Ill. DSA 700-70-C-9619.

Caterpillar Tractor Co., Peoria, Ill. $14,763,984. 414 full-track medium tractors. DSA 700-70-C-9522.

Earthmoving Equipment Div., General Motors Corp., Hudson, Ohio. $2,765,184. 64 Terex model 82-30/M full-tracked tractors. DSA 700-70-C-9604.

26—**Rapistan, Inc.,** Rockville, Md. $1,025,957. Mechanized materials handling system for the Navy. Grand Rapids, Mich. Defense Construction Supply Center, Columbus, Ohio. DSA 700-70-C-9600.

—**Sauk Valley Manufacturing Co.,** Oakland, Calif. $1,599,114 (contract modification). 126,646 spools of barbed wire. Defense Construction Supply Center, Columbus, Ohio. DSA 700-70-C-A080.

—**Franklin Clothes, Inc.,** Woodbine, N.J. $1,230,498. 73,375 men's polyester wool serge coats for the Air Force. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-70-C-2062.

29—The following contracts for cotton sateen cloth were awarded by the Defense Personnel Support Center, Philadelphia, Pa.:

Saddler Textile, Inc., New York, N. Y. $1,131,145. 1,000,000 linear yards (45-in. wide) and 1,110,714 linear yards (42-in. wide). Batesburg, S.C.; Eastman, Ga.; and Opelika, Ala. DSA 100-70-C-2036.

Graniteville Co., New York, N. Y. $1,621,800. 2,400,000 linear yards (42-in. wide). Augusta, Ga.; and Graniteville, S.C. DSA 100-700-C-2038.

Prestex, Inc., New York, N.Y. $2,924,617. 5,000,000 linear yards (45-in. wide). Batesburg, S.C.; Eastman and Commerce, Ga.; and Opelika, Ala. DSA 100-70-C-2027.

Riegel Textile Corp., New York, N.Y. $5,280,800. 8,000,000 linear yards (45-in. wide). Ware Shoals, S.C.; and Trion, Ga. DSA 100-70-C-2029.

—**Outboard Marine Corp.,** Milwaukee, Wis. $1,189,000. 660 centrifugal pumps. Galesburg, Ill. Defense Construction Supply Center, Columbus, Ohio. DSA 700-70-C-9617.

DEPARTMENT OF THE ARMY

1—**Missouri Pacific Railroad Co., and Missouri Illinois Railroad Co.,** St. Louis, Mo. $9,000,000. Relocation of a railroad crossing over the Kaskaskia River, Randolph County, Ill. Army Engineer District, St. Louis, Mo. D-CW43-70-C-0087.

—**Stanford University,** Stanford, Calif. $1,948,529 (contract modification). Research in mathematical theory computation and related areas of computer science. Defense Supply Service, Washington, D.C. DA-SD-63-183.

—**Bernard McMenamy Contractor, Inc.,** St. Charles, Mo. $5,342,600. Excavation of approximately 5 miles of navigation channel, Monroe and St. Clair counties, Ill. Army Engineer District, St. Louis, Mo. DA-CW43—70-C-0188.

—**Hughes Aircraft Co.,** Culver City, Calif. $7,777,866. FY 1970 TOW missile ground support equipment. El Segundo and Culver City, Calif. Army Missile Command, Huntsville, Ala. DA-AH01-70-C-0318.

—**Guy F. Atkinson Co.,** San Francisco, Calif. $61,724,437. Construction of an earth fill dam at the Cochiti Dam and Reservoir Project, Sandoval County, N.M. Army Engineer District, Albuquerue, N.M. DA-CW47-70-C-0006.

—**Con-Plex Div., US Industries, Inc.,** New Orleans, La. $1,149,732. Construction of a hurricane protection levee and flood wall, Lake Pontchartrian Hurricane Protection Project, New Orleans, La. Army Engineer District, New Orleans, La. DA-CW29-70-C-0226.

2—**The Teletype Corp., Skokie, Ill.** $3,000,000. Classified electronic equipment. Army Electronics Command, Fort Monmouth, N.J.

—The **Holiday Construction Co.,** Greenville, Ga. $1,150,742. Road construction, Troup County, Ga. Army Engineer District, Savannah, Ga. DA-CW21-70-C-0048.

3—**Southern Airways of Texas, Inc.,** Fort Wolters, Tex. $36,288,000 (contract modification). Training of helicopter pilots, aircraft maintenance and related services. Purchasing and Contracting Office, Fort Wolters, Tex. DA-BD13-69-C-0012.

—**Electro Magnetic Technology Corp.,** Montgomeryville, Pa. $1,117,771. Vulcan weapon system test equipment. Frankford Arsenal, Philadelphia, Pa. DA-AA25-70-C-0559.

—**Acme Construction Co., Inc.,** Cleveland, Ohio. $3,177,222. Construction of a dam and appurtenant works, North Branch of the Kokosing Reservoir, Ohio. Army Engineer District, Huntington, W. Va. DA-CW69-70-C-0067.

—**D. R. Allen and Sons, Inc.,** Fayetteville, N.C. $1,069,706. Channel improvement, Lick Run, Bedford County, Va. Army Engineer District, Wilmington, N.C. DA-CW54-70-C-0035.

—**Sheidow Bronze Corp.,** Kingwood, W. Va. $1,683,120. 75,000 bronze grave markers. The Office of the Chief of Support Services, Memorial Division, Washington, D.C. DA-49-056-SS(70)-396.

4—**Industrial Contractors, Inc.,** Idaho Falls, Idaho. $3,074,224. Construction of a test area building and a control building, Arnold Engineering Development Center, Tullahoma, Tenn. Army Engineer District, Mobile, Ala. DA-CA01-70-C-0049.

5—The **International Terminal Operating Co., Inc.,** New York, N.Y. $20,758,758. Stevedoring and related terminal services at the Military Area MTMTS, Brooklyn, N.Y. Eastern Area Military Traffic Management and Terminal Service, Brooklyn, N.Y. DA-HC21-70-D-0174.

—**International Harvester Co.,** Southfield, Mich. $3,749,608. 1,081 4x2 stake trucks. Springfield, Ohio. DA-AE07-C-4377. $1,602,078. 207 4x2 truck tractors. Ontario, Canada. DA-AE07-70-C-4366. Army Tank Automotive Command, Warren, Mich.

—**Embry-Riddle Aeronautical Institute,** Daytona Beach, Fla. $4,038,341. Fixed and rotary wing instrument flight training. Fort Rucker, Ala. Army Aviation Center and School, Fort Rucker, Ala. DA-BC01-71-C-0003.

8—**M. M. Sundt Construction Co.,** Tucson, Ariz. $1,344,056. Excavation of five miles of channel with compacted fill levee and stone facing, Ruby Wash Diversion Levee, Winslow, Ariz. Army Engineer District, Los Angeles, Calif. DA-CW09-70-C-0092.

—**Bush Construction Co.,** Norfolk, Va. $4,394,000. Design and construction of 250 family housing units, Fort Meade, Md. Army Engineer District, Baltimore, Md.

—**Cramer Brothers Construction Co.,** Des Moines, Iowa. $1,979,972. Stage II construction of an earth levee and concrete flood wall. Army Engineer District, Rock Island, Ill. DA-CW25-70-C-0073.

—**Dravo Corp.,** Pittsburgh, Pa. $41,905,340. Construction of a dam and appurtenant works, and removal of existing locks and dams, Newburgh Locks and Dams Project, Warwick County, Ind., and Henderson County, Ky. Army Engineer District, Louisville, Ky. DA-CW27-70-C-0110.

—**Conductron Corp.,** St. Charles, Mo. $1,500,000 (contract modification). Classified electronics equipment. Army Electronics Command, Fort Monmouth, N.J.

—**Poland Contracting Corp.,** Poland, Ohio. $2,732,621. Treatment of existing pipe outlets and sanitary sewer crossings, clearing and related work, Local Protection Project, Youngstown, Ohio. Army Engineer District, Pittsburgh, Pa. DA-CW59-70-C-0173.

—**Rosiek Construction Co., Inc.,** Morrilton, Ark. $2,488,270. Construction of a concrete gated spillway, bridge and service building, Carter's Dam, Murray County, Ga. Army Engineer District, Mobile, Ala. DA-CW01-70-C-0253.

9—**Zenith Radio Corp.,** Chicago, Ill. $2,070,000 (contract modification). M429 fuzes for 2.75 inch rockets. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-70-C-0193.

10—**Philco-Ford Corp.,** Palo Alto, Calif. $7,975,793. One heavy and one medium transportable satellite communications terminals. Army Electronics Command, Fort Monmouth, N.J. DA-AB07-70-C-0234.

—**Beech Aircraft Corp.,** Wichita, Kan. $6,862,000. U-21A utility aircraft. Army Aviation Systems Command, St. Louis, Mo. DA-AJ01-70-C-0760.

—**Jahncke Service, Inc.,** New Orleans, La. $1,297,700. Construction of first-lift portion of the Chalmette Extension Huricane Protection Levee, St. Bernard Parish, La. Army Engineer District, New Orleans, La. DA-CW29-70-C-0243.

—**Great Lakes Dredge and Dock Co.,** New York, N.Y. $1,013,644. Dredging channels in the vicinity of Staten Island, N.Y. and Bayonne, N.J. Army Engineer District, New York, N.Y. DA-CW51-70-C-0035.

—**List and Clark Construction Co.,** Overland Park, Kan. $6,005,728. Highway and bridge construction, Harry S. Truman Dam and Reservoir, Benton County, Mo. Army Engineer District, Kansas City, Mo. DA-CW41-70-C-0098.

—**J. R. Youngdale Construction Co., Inc.,** and **T. Walter Johnson** (joint venture), San Diego, Calif. $2,111,294. Three one-story buildings, Fort Knox, Ky. Army Engineer District, Louisville, Ky. DA-CA27-70-C-0034.

—**AVCO Corp.,** Stratford, Conn. $1,338,921. Modification kits for T-53 gas turbine engines. Army Aviation Systems Command, St. Louis, Mo. DA-AJ01-70-A-0334.

11—The Army Electronics Command, Fort Monmouth, N.J., issued the following contracts:

Servo Corp. of America, Hicksville, N.Y. $2,146,980. Development, fabrication and test of two automatic atmospheric sounding sets (AN/TMQ-19) for use in the Meteorological Data Sounding Systems (AN/NMQ-7). DA-AB07-70-C-0242.

SCM Corp., Deerfield, Ill. $5,900,000. 32 engineering development and service test models of the Forward Area Tactical Teletypewriter and ancillary items. DA-AB07-70-C-0177.

—The following contracts were issued by the Army Electronics Command, Philadelphia, Pa.:

Hamilton Watch Co., Lancaster, Pa. $1,-

085,796 (contract modification). AN/PRC-77 radio sets and RT-841/PRC-77 receiver-transmitters. DA-AB05-70-C-4412..

Bristol Electronics, Inc., New Bedford, Mass. $2,114,016. AN/PRC-25 radio sets. DA-AB05-70-C-4416.

—**International Harvester Co.**, Southfield, Mich. $1,800,953. 330 stake, van and trailer trucks. Springfield, Ohio. Army Automotive Command, Warren, Mich. DA-AE07-70-C-4365.

—**AVCO Corp.**, Stratford, Conn. $1,631,265. Turbine nozzles for the T-53 gas turbine engine. Army Aviation Systems Command, St. Louis, Mo. DA-F-41-608-69-A-2421.

12—The Army Engineer District, Kansas City, Mo., issued the following contracts:

List and Clark Construction Co., Overland Park, Kan. $4,388,103. Construction of an embankment levee, Missouri River, Platte County, Kan. DA-CW47-70-C-0101.

Anderson Construction Co., Inc., Holton, Kan. $2,675,000. Relocation of section II, Missouri state highway 7, and construction of a 2,000 plate girder bridge and approximately two miles of road, Denton County, Mo. DA-CW41-70-C-0102.

—**Westinghouse Electric Corp.**, Portland, Ore. $1,207,391. Single and three phase power transformers. Muncie, Ind., and Clearwater County, Idaho (installation). Army Engineer District, Walla Walla, Wash. DA-CW68-70-C-0110.

—**J, B and C Co.**, Scottsdale, Ariz. $1,154,128. Construction of 3,500 feet of concrete channel, Corte Madera Creek, Marin County, Calif. Army Engineer District, San Francisco, Calif. DA-CW07-70-C-0097.

—**American Standard, Inc.**, Falls Church, Va. $4,500,000. Classified electronic equipment. Falls Church and Mountain View, Calif. Army Electronics Command, Fort Monmouth, N.J.

—**Interlake, Inc.**, Riverdale, Ill. $1,240,000. One automated stocker and retrieval system for depot maintenance rebuild activities at the Anniston Army Depot. Anniston Army Depot, Anniston, Ala. DA-AG02-70-C-0077(J).

—**Gulf and Western Industries**, Waukesha, Wis. $1,130,655. Metal parts for body assemblies for the M384. Army Procurement Agency, Chicago, Ill. DA-AA09-70-C-0281.

15—The Army Ammunition Proceurement and Supply Agency, Joliet, Ill., issued the following contract modifications:

Hercules, Inc., Wilmington, Del. $8,465,158. Operation of the propellant production facility, Army Ammunition Plant, Radford, Va. DA-11-173-AMC-00037(A).

Olin Corp., Stamford, Conn. $3,974,918. Operation of the propellant production facility, Army Ammunition Plant, Charleston, Ind. DA-AA09-69—C-0148.

—**The Aluminum Co. of America**, Pittsburgh, Pa. $1,338,000. 2.75-inch rocket motor tubes. Kensington, Pa. Picatinny Arsenal, Dover, N.J. DA-AA21-70-C-0256.

—**H. A. Anderson Co., Inc.**, Portland, Ore. $9,120,000. Construction of a fish hatchery, Lost Creek Reservoir, Jackson County, Ore. Army Engineer District, Portland, Ore. DA-CW57-70-C-0132.

—**Jordan and Nobles Construction Co.**, El Paso, Tex. $1,210,000. Construction of two concrete buildings, relocation of an existing metal building, erect and furnish a metal pre-fab building, and construction of sidewalks, paving and utilities, White Sands Missile Range, N.M. Army Engineer District, Fort Worth, Tex. DA-CA63-70-C-0070.

16—The Army Ammunition Procurement and Supply Agency, Joliet, Ill., issued the following contracts:

Universal Automatic Machine, Inc., Marshall, Tex. $1,032,229. Lifting plugs for 155mm, 175mm and 8-inch projectiles. DA-AA09-70-C-0389.

The National Metals Manufacturing Co., Centerville, Iowa. $12,444,071. Metal parts for 155mm M107, projectiles. Sylacouga, Ala. DA-AA09-70-C-0418.

—**The Tiombo Corp.**, San Carlos, Calif. $4,828,059. Road and bridge construction and repair work, Dry Creek Reservoir and Channel, Sonoma County, Calif. Army Engineer District, San Francisco, Calif. DA-CW07-70-C-0099.

—**L and A Contracting Co., Inc.**, Hattiesburg, Miss. $1,077,237. Construction of a four-bay control structure with automatic controlled lift gates, removal of two canal plugs, and random shoals, Four River Basins Project, Pinellas County, Fla. Army Engineer District, Jacksonville, Fla. DA-CW17-70-C-0088.

—**Amron-Orlando Div., Gulf and Western Industries, Inc.**, Orlando, Fla. $1,104,788. M551 fuze metal parts. Army Procurement Agency, Chicago, Ill. DA-AA09-70-C-0103.

—**Pettibone Corp.**, Bethesda, Md. $3,378,450. 90 rough terrain fork-lift trucks. Chicago, Ill. Army Mobility Equipment Command, St. Louis, Ill. DA-AK01-70-C-7149.

17—The Army Electronics Command, Philadelphia, Pa., issued the following contracts:

Gichner Mobile Systems, Inc., Dallastown, Pa. $1,107,859. Electrical equipment shelters. DA-AB05-69-C-0019.

Futuronics Corp., Port Washington, N.Y. $2,612,346. 2,328 teletypewriter sets. DA-AB05-70-C-4121. $2,017,080. 1,504 teletypewriter transmitter reperforators. Freeport, N.Y. DA-AB05-70-C-4123.

—The Director of Procurement, Western Area Military Traffic Management and Terminal Service, Oakland, Calif., issued the following contracts:

California Stevedore and Ballast Co., San Francisco, Calif. $24,996,212. Stevedoring and related services, Army base facilities, Oakland. DA-HC23-70-D-0085.

Marine Terminals Corp. of Los Angeles, Long Beach, Calif. $10,500,000. Stevedoring and related services, Southern California Outport, Long Beach. DA-HC23-70-D-0081.

—**Gordon H. Ball, Inc.**, and **Granite Construction Co.** (joint venture), Danville, Calif. $26,196,440. Construction of a 23-foot diameter steel and concrete lined tunnel approximately 3,400 feet long, and outlet works, New Malones Reservoir, Stanislaus River, Stanislaus and Tuolumme Counties, Calif. Army Engineer district, Sacramento, Calif. DA-CW05-70-C-0106.

—**Dickerson, Inc.**, Monroe, N.C. $4,778,512. Construction of 2.7 miles of two lane highway, and two concrete bridges, New Hope Reservoir, Chatham County, N.C. Army Engineer District, Wilmington, N.C. DA-CW54-70-C-0034.

—**Lueder Construction Co.**, Omaha, Neb. $1,581,293. Construction of control tower additions and a utility building, Offutt AFB, Neb. Army Engineer District, Omaha, Neb. DA-CA45-70-C-0099.

—**Western Electric Co.**, New York, N.Y. $1,500,000 (contract modification). Additional research and development on the modified Spartan subsystem of the Safeguard Ballistic Missile Defense System. McDonnell-Douglas Corp., Santa Monica, Calif., Army Safeguard System Command, Huntsville, Ala. DA-30-069-AMC-00333(Y).

—**L. E. Mayson**, Hyde Park, Mass. $1,312,000. Air munitions nose assemblies. Edgewood Arsenal, Md. DA-AA15-70-C-0474.

—**Batesville Manufacturing Co.**, Batesville Ark. $2,257,700. M72A1 rocket launchers. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-70-C-0421.

—**The Electronic Memories and Magnetic Corp.**, Hawthorne, Calif. $1,250,000. Classified electronic equipment. Army Electronics Command, Fort Monmouth, N.J.

—**The Appalachian Contracting Co.**, Robinsville, N.C. $1,054,100. Clearing and disposal of trees and stumps, Connelton Lock and Dam Project, Hancock, Breckinridge, Bullitt and Meade Counties, Ky., and Perry, Crawford and Harrison Counties, Ind. Army Engineer District, Louisville, Ky. DA-CW27-70-C-0124.

18—**Washington University**, St. Louis, Mo. $1,200,000 (contract modification). Development of a macro-modular computer system. Defense Supply Services, Washington, D.C. DA-SD-65-00302.

—**Telletsen Construction Co.**, Houston, Tex. $3,604,898. Hurricane flood protection pump station structures, Jefferson County, Tex. Army Engineer District, Galveston, Tex. DA-CW64-70-C-0082.

—**Farrell Construction Co., Inc.**, Memphis, Tenn. $11,156,706. Dam, levee, service building and diversion channel construction, Wallisville Dam and Reservoir, Chambers County, Tex. Army Engineer District, Galveston, Tex. DA-CW64-70-C-0083.

—**Forsberg and Gregory, Inc.**, Redlands, Calif. $1,924,854. Construction of 100 family housing units, Fort Huachuca, Ariz. Army Engineer District, Los Angeles, Calif. DA-CA09-70-C-0090.

19—**Industrial Design Labs, Inc.**, Culver City, Calif. $1,572,460. M8 portable automatic chemical agent alarms, M229 refill kits, and various quantities of testers, provisioning parts and manuscripts. Edgewood Arsenal, Md. DA-AA15-70-C-0447.

—**Servidone Construction Corp.**, Castleton, N.Y. $4,711,352. Construction of levees, flood walls and drainage system, pumping station and closure gate, Raritan and Sandy Hook Bays Project, Monmouth County, N.J. Army Engineer District, New York, N.Y. DA-CW51-70-C-0040.

—The Army Ammunition Procurement and Supply Agency, Joilet, Ill., issued the following contracts for metal parts for M117 AIEI 750-pound bombs:

R. G. LeTourneau, Inc., Longview, Tex. $6,238,400. DA-AA09-70-C-0411.

American Machine and Foundry Co., New York, N.Y. $1,327,656 (contract modification). DA-AA09-70C-0279.

—**Amis Construction Co.**, Oklahoma City, Okla. $7,915,430. Construction of an embankment, outlet works, spillway, access roads and project buildings, Dierks Dam Project, Howard and Sevier Counties, Ark. Army Engineer District, Tulsa, Okla. DA-CW56-70-C-0159.

—**J. B. Denny Jr.**, Norfolk, Va. $1,350,706 Five story bachelor officers quarters, Fort Lee, Va. Army Engineer District, Norfolk, Va. DA-CA65-70-C-0104.

—**Mountain State Construction Co., Inc.**, Charleston, W. Va. $8,999,636. Construction of a tunnel, spill basin, control tower and access bridge, Cathright Reservoir Project, Va. Army Engineer District, Norfolk, Va., DA-CW65-70-C-0075.

—**Western Electric Co.**, New York, N.Y. $2,000,000 (contract modification). Additional research and development on the Spartan subsystem of the Safeguard ballistic missile defense system. McDonnell-Douglas Corp., Santa Monica, Calif. Safeguard System Command, Huntsville, Ala. DA-30-C69-AMC-333.

22—**Beckman Construction Co.**, Fort Worth, Tex. $1,176,740. Development of an area for public use, Stockton Reservoir Project, Cedar and Wade Counties, Mo. Army Engineer District, Kansas City, Mo. DA-CW41-70-C-0110.

—The Army Ammunition Procurement and Supply Agency, Joliet, Ill., issued the following contract modifications for metal parts for M106 high explosive 8-inch projectiles:

National Presto Industries, Eau Claire, Wis. $3,411,478. DA-AA09-69-C-0109.

United States Steel Corp., Pittsburgh, Pa. $1,893,711. Berwick, Pa. DA-AA09-70-C-0238.

—**Frank Tasch**, Silver City, N.M. $1,016,200. Construction of a development facility consisting of a masonry building and a prefab metal building, and paving and utilities, White Sands Missile Range, N.M. Army Engineer District, Fort Worth, Tex. DA-CA63-70-C-0073.

—**Department of Public Works and Buildings**, Springfield, Ill. $3,730,000. Design and relocation construction work, Illinois state highway 3, Kaskaskia River, Randolph County, Ill. Army Engineer District, St. Louis, Mo. DA-CW43-70-C-0138.

—**Texas Instruments Inc.**, Dallas, Tex. $2,500,000. Classified electronic equipment. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. DA-AK02-70-C-0566.

—**Chrysler Corp.**, Sterling Township, Mich. $5,225,000 (contract modification). Systems engineering management for the M60/M60A1 tank, M48A3, M60A1 chassis, and M728 combat engineer vehicle. Army Weapons Command, Rock Island, Ill. DA-AF03-70-C-0075.

23—**Crown Construction Co.**, Columbus, Ga $5,075,000. Construction of 340 family housing units, Fort Benning, Ga. Army Engineer District, Savannah, Ca. DA-CA21-70-C-0056.

—**Burns, Kirkley and Williams, Inc.**, Auburn, Ala. $1,232,807. Construction of aviation training facilities, Fort Rucker, Ala. Army Engineer District, Mobile, Ala. DA–CA01–70–C–0050.

—**General Construction Co.,** Fargo, N.D. $6,989,763. Construction of a levee and flood wall, Port Arthur Hurricane Flood Protection Project, Jefferson County, Tex. Army Engineer District, Galveston, Tex. DA–CW64–70–C–0088.

—The Army Ammunition Procurement and Supply Agency, Joliet, Ill., issued the following contract modifications:

Day and Zimmerman, Inc., Philadelphia, Pa. $5,214,832. Operation of facilities, Army Ammunition Plant, Parsons, Kans. DA–AA09–70–C–0245.

Maxson Electronic Corp. of Riker-Maxson, Macon, Ga. $2,276,649. Loading and assembling 60mm illuminating projectiles, M83A3. DA–AA09–70–C–0165.

Medico Industries, Inc., Wilkes-Barre, Pa. $2,799,000. Metal parts, XM229, for 2.75 inch rockets. DA–AA09–70–C–0365.

—**Industrial Engineering Co., Inc.,** Baltimore, Md. $2,589,000. Construction of an addition to Kimbrough Army Hospital, and renovation of existing structure, Fort Meade, Md. Army Engineer District, Baltimore, Md. DA–CA31–70–C–0066.

—**AVCO Corp.,** Wilmington, Mass. $1,993181. Classified research and development. Defense Atomic Support Agency, Washington, D.C. DA–SA01–70–C–0158.

—**TRW, Inc.,** Redondo Beach, Calif. $5,000,000. Classified research and development. Army Electronics Command, Fort Monmouth, N.J.

—**Saginaw Products Corp.,** Saginaw, Mich. $1,137,436. 731 two-wheel trailer chassis, M353. Army Tank Automotive Command, Warren, Mich. DA–AE07–70–C–4640.

—**B. Bornstein and Son, Inc.,** Philadelphia, Pa. $3,593,150. Construction of confinement facilities, Fort Dix, N.J. Army Engineer District, New York, N.Y. DA–CA51–70–C–0084.

—**Beatrice Foods,** Honolulu, Hawaii. $1,046,009. Furnishing of dairy products for FY 1971. Office of the Assistant Chief of Staff for Logistics, U.S. Army, Hawaii. DA–GA01–70–D–0577.

24—**Anthony J. Bertucci Construction Co.,** New Orleans, La. $1,595,250. Construction of bank paving at various locations along the Mississippi, Atchafalaya and Red Rivers. Army Engineer District, New Orleans, La. CA–CW29–70–C–0266.

—**Umpqua River Navigation Co. Div., Bohemia Lumber Co.,** Eugene, Ore. $9,185,000. Rehabilitation of the Humboldt Bay jetty, Eureka, Calif. Army Engineer District, San Francisco, Calif. DA–CW07–70–C–0103.

—**National Presto Industries,** Eau Claire, Wis. $6,639,725. Metal parts for 105mm projectiles, M1. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–AA09–69–C–0028.

—**Daniel and House Construction Co.,** Monterey, Calif. $1,668,318. Construction of a three story 400-man dormitory, Language School, Presidio, Monterey, Calif. Army Engineer District, Sacramento, Calif. DA–CA05–70–C–0070.

—**Goodyear Tire and Rubber Co.,** Akron, Ohio. $1,576,277 (contract modification). Track shoe assemblies for M113 personnel carriers. St. Mary's, Ohio. Army Tank Automotive Command, Warren, Mich. DA–AE07–70–C–4152.

—**Page Airways, Inc.,** Rochester, N.Y. $1,279,565. Automated storage and retrieval system for depot maintenance activities, Tobyhanna Army Depot, Pa. Tobyhanna Army Depot, Tobyhanna, Pa. DA–AG38–70–C–0191.

—**Lane Construction Corp.,** Meriden, Conn. $7,356,517. Construction of an embankment, channel spillway and outlet work, Woodcock Dam, Crawford County, Pa. Army Engineer District, Pittsburgh, Pa. DA–CW59–70–C–0179.

—**A. J. Kanipe and Sons,** and **Jim R. Smith Contracting Co., Inc.** (joint venture), Smithland, Ky. $1,194,430. 13 miles of channel excavation stone protection work, Saline River, Gallintin County, Ill. Army Engineer District, Louisville, Ky. DA–CW27–70–C–0129.

25—**Dorsett Electronics,** Tulsa, Okla. $1,300,000. Classified electronics equipment. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. DA–AK02–70–C–0577.

—**Holloway Construction Co., Holloway Sand and Gravel, Inc.,** and **Halloway Sand and Gravel Trucking Corp.** (joint venture), Wixsom, Mich. $14,899,671. Stage III embankment, Chatfield Dam and Reservoir, South Platte River, Colo. Army Engineer District, Omaha, Nebr. DA–CW45–70–C–0095.

—**Federal Systems Div., IBM Corp.,** Gaithersburg, Md. $3,568,782 (contract modification). Combat Services Support Systems (CS3) for one year. Fort Hood, Tex., and Germany. Procurement Office, Army Electronic Command, Washington, D.C. DA–AB09–67–C–0408.

—**Great Lakes Dredge and Dock Co.,** New Orleans, La. $2,277,085. Dredging a 40-foot deep channel in waterways adjacent to Port Arthur, Tex. Army Engineer District, Galveston, Tex. DA–CW64–70–C–0090.

—**Frequency Engineering Labs of Harvard Industries,** Farmingdale, N.J. $4,345,430. XM28E1 armament sub-systems for the AH–1G Cobra helicopter. Army Weapons Command, Rock Island, Ill. DA–AF03–70–C–0083.

—**Aerojet General, Inc.,** Nimbus, Calif. $3,610,000. Rocket motors for Hawk missiles. Army San Francisco Procurement Agency, Oakland, Calif. DA–AG05–70–C–0733.

—**Acushnet Co.,** New Bedford, Mass. $1,122,416. M25A1 protective tank masks and ABC–M24 protective aircraft masks. Edgewood Arsenal, Md. DA–AA15–70–C–0411.

—**Texas Instruments, Inc.,** Dallas, Tex. $1,241,510 (contract modification). Preliminary ballistic missile defense equipment development for data processing system. Safeguard System Command, Huntsville, Ala. DA–HC60–70–C–0051.

—The Army Mobility Equipment Command, St. Louis, Mo., issued the following contracts:

Southwest Truck Body Co., Inc., St. Louis, Mo. $1,418,488. 104 retrofit kits for shop equipment, electronic and electrical repair. DA–AK01–70–C–7689.

Caterpillar Tractor Co., Peoria, Ill. $2,580,262. 48 wheeled tractors. DA–AK01–70–C–7688.

Athey Products Corp., Raleigh, N.C. $6,372,050. 220 fork-lift trucks. Wake Forest, N.C. DA–AK01–70–C–7958.

Fourdee, Inc., Pasadena, Calif. $1,021,477. Portable mine-detecting sets. DA–AK01–70–C–7973.

V.P. Co., Pasadena, Calif. $1,023,143. Portable mine-detecting sets. DA–AK01–70–C–7694.

26—**Hamet Co., Inc.,** Paducah, Ky. $2,268,498. Construction of three spillways with lift gates, and excavation of three canals, Central and Southern Florida Project, Dade County, Fla. Army Engineer District, Jacksonville, Fla. DA–CW17–70–C–0082.

—**Harvey Aluminum Co., Inc.,** Torrance, Calif. $1,172,500 (contract modification). 40mm cartridge cases, M118. Army San Francisco Procurement Agency, Oakland, Calif. DA–AA09–70–C–0264.

—**Hughes Aircraft Co.,** Culver City, Calif. $1,033,109. Maintenance test equipment, technical manuals and new equipment training for depot maintenance equipment for the TOW missile system. Army Missile Command, Huntsville, Ala. DA–AH01–70–C–0922.

—**Luedtke Engineering Co.,** Frankfort, Mich. $1,326,537. Maintenance placement of stone protection on the north breakwater of the Ludington Harbor Project, Mich. Army Engineer District, Detroit, Mich. DA–CW35–70–C–0052.

—**King-Hunter,** Greensboro, N.C. $2,256,568. Construction of a one-story and a six-story building, Fort Bragg, N.C. Army Engineer District, Savannah, Ga. DA–CA21–70–C–0061.

—**Burns, Kirkley and Williams,** Auburn, Ala. $1,232,043. Construction of an 80-unit addition to an existing Bachelor Officers' Quarters, and construction of a three-story 60-unit motel-type BOQ, Fort Rucker, Ala. Army Engineer District, Mobile, Ala. DA–CA01–70–C–0052.

—The Army Electronics Command, Fort Monmouth, N.J., issued the following contracts:

University of Illinois, Urbana, Ill. $1,035,000 (contract modification). An additional 12 months research in electronics and plasma technology. DA–AB07–67–C–0199.

D.E.I. Industries, Inc., Rockville, Md. $1,529,092. VHF/FM airborne radio sets, AN/ARC–131. DA–AB07–70–C–0277.

—The Army Ammunition Procurement and Supply Agency, Joliet, Ill., issued the following contract modifications:

Remington Arms Co., Inc., Bridgeport, Conn. $28,834,441 (contract modification). Operation of 20mm cartridge production facilities, Lake City Army Ammunition Plant, Independence, Mo. DA–49–010–AMC–3(A).

Federal Cartridge Corp., Minneapolis, Minn. $6,905,345. Loading, assembling and packing 5.6mm and 7.62mm cartridges, and related support services, Twin Cities Army Ammunition Plant, New Brighton, Minn. DA–36–038–AMC–1099(A).

—**Amron Div. of Gulf and Western Industries,** Waukesha, Wis. $5,567,400. 20mm brass cartridge cases, M103. Frankford Arsenal, Philadelphia, Pa. DA–AA25–70–C–0495.

—**Hawthorne Aviation,** Charleston, S.C. $2,423,275 (contract modification). Aircraft maintenance and related test support services. Cairns Army Air Field, Fort Rucker, Ala. Aberdeen Proving Ground, Md. DA–AD05–69–C–0417.

—**Hunt Building Mart, Inc.,** El Paso, Tex. $3,309,034. Construction of 150 family housing units, Fort Carson, Colo. Army Engineer District, Kansas City, Mo. DA–CA41–70–C–0053.

—**Martin-Zachry Constructors,** Honolulu, Hawaii. $1,500,000 (contract modification). Construction of a civilian dormitory, Roi Namur Island, Marshall Islands. Army Engineer District, Honolulu, Hawaii. DA–CA83–70–C–0014.

29—**Litton Systems, Inc.,** Sunnyvale, Calif. $3,522,434 (contract modification). 1,656 man-months of scientific and technical support for experimentation for the Combat Development Command Experimental Center. Fort Ord and Hunter-Ligget Military Reservation, King City, Calif. Army San Francisco Procurement Agency, Oakland, Calif. DA–AG05–67–C–3096.

—**Brencal Contractors, Inc.,** Detroit, Mich. $2,535,500. Construction of a vehicle track and suspension laboratory, Detroit Arsenal. Army Engineer District, Chicago, Ill. DA–CA23–70–C–0078.

—**Philco-Ford Corp.,** Willow Grove, Pa. $2,685,000. Integration of defense special security communications systems in the AUTODIN network. Willow Grove and 12 overseas sites. Army Electronics Command, Fort Monmouth, N.J. DA–AB07–70–C–0322.

—**Jervis B. Webb,** Detroit, Mich. $2,411,370. Manufacture and installation of an integrated materials handling system. Army Procurement Agency, New York, N.Y. DA–AG25–70–C–0617.

—**Urban System Development Corp.,** Arlington, Va. $2,250,000. Construction of 100 family housing units, Vint Hill Farms Station, Warrenton, Va. Army Engineer District, Norfolk, Va. DA–CA65–70–C–0111.

—The Army Ammunition Procurement and Supply Agency, Joliet, Ill., issued the following contract modifications:

General Motors Corp., Detroit, Mich. $3,524,776. Lay-away and rehabilitation work on facilities, Army Ammunition Plant, St. Louis, Mo. DA–AA09–67–C–0025.

Donovan Construction Co., New Brighton, Minn. $3,501,100. Metal parts for 155mm projectiles, M107. Twin Cities Army Ammunition Plant. DA–AA09–70–C–0085.

National Presto Industries, Inc., Eau Claire, Wis. $9,335,567. Metal parts for 105mm projectiles. DA–AA09–69–C–0028.

Mason and Hanger, Silas Mason Co., Inc., New York, N.Y. $1,360,530. Operation of ammunition assembling facilities, Cornhusker Army Ammunition Plant, Grand Island, Neb. DA–AA09–68–C–0383.

Mason and Hanger, Silas Mason Co., Inc., Lexington, Gy $3,108,890. Loading, assembling and packing XM131 components for 155mm projectiles, Army Ammunition Plant, Burlington, Iowa. DA-AA09-68-C-0468.

—The Army Missile Command, Huntsville, Ala., issued the following contracts:

RCA, Burlington, Mass. $4,648,666. FY 1970 research, development, test and evaluation program for land combat support systems. DA-AH01-70-C-1342.

Teledyne-Ryan Aeronautical Co., San Diego, Calif. $2,810,218. Flight services for the MQM-34D Firebee target missile system operations at ranges in New Mexico, Okinawa and Korea. DA-AH01-70-C-0010.

Systems Development Corp., Santa Monica, Calif. $1,348,562. Systems training program for Air Defense Control Systems. DA-AH01-70-C-0006.

—The following contracts were awarded by the Army Engineer District, New Orleans, La.:

Standard Dredging Corp., New Orleans, La. $1,953,900. Construction of the first lift of a hurricane protection levee, including 2,000,000 cubic yards of hydraulic fill, Lake Pontchartrain Project, St. Bernard Parish, La. DA-CW29-70-C-0275.

Atlas Construction Co., Inc., Vidalia, La. $4,459,605. Construction of first lift of a hurricane protection levee on the west bank, Mississippi River between Empire and Buras, Plaquemines Parish, La. DA-CW29-70-C-0273.

—The Army Weapons Command, Rock Island, Ill., issued the following contracts:

Philco-Ford Corp., Newport Beach, Calif. $1,697,000. 100 XM182 pintle mounts. Newport Beach and Anaheim, Calif. DA-AF03-70-C-0084.

Chrysler Corp., Sterling Township, Mich. $6,000,000 (contract modification). System engineering management for M60-A1E2 tanks. Centerline, Mich. DA-AF03-69-C-0087.

—**Rubber Fabricators, Inc.**, Grantsville, W. Va. $1,151,186. Collapsible water tanks, 1,500 and 3,000 gallon capacity. Richwood, W.Va. Army Mobility Equipment Command, St. Louis, Mo. DA-AK01-70-C-7975.

—The Army Aviation Systems Command, St. Louis, Mo., awarded the following contracts:

Bell Helicopter Co., Fort Worth, Tex. $11,290,912. UH-1N helicopters. Hurst, Tex. DA-AJ01-70-C-0234.

Lockheed Missiles and Space Co., Sunnyvale, Calif. $2,503,054. Support items for YO-3A aircraft. DA-AJ01-70-A-0326.

—**D. M. Weatherly Co.**, Atlanta, Ga. Three contracts for design and construction of ammonia oxidation nitric acid units (used in making TNT), and associated air pollution control: $2,840,000, Army Ammunition Plant, Joliet, Ill., DA-CA01-70-C-0055; $2,334,400, Volunteer Army Ammunition Plant, Chattanooga, Tenn., DA-CA01-70-C-0054; $2,795,000, Army Ammunition Plant, Radford, Va., DA-CA01-70-C-0056. Army Engineer District, Mobile, Ala.

—**Monsanto Enviro-Chem Systems, Inc.**, Chicago, Ill. Design and construction of oleum-sulphuric acid recovery units, and associated pollution control, at these locations: $6,101,100, Army Ammunition Plant, Radford, Va., DA-CA01-70-C-0061; $5,270,000, Volunteer Army Ammunition Plant, Chattanooga, Tenn., DA-CA01-70-C-0059; $7,364,740, Army Ammunition Plant, Joliet, Ill., DA-CA01-70-C-0060. Army Engineer District, Mobile, Ala.

—**Simplex Wire and Cable Co.**, Portsmouth, N.H. $1,617,860. 55 nautical miles of ocean telephone coaxial cable. Safeguard Systems Command, Huntsville, Ala. DA-HC60-70-C-0083.

—**Pacific Car and Foundry Co.**, Renton, Wash. $1,715,860. Engineering services and provisioning in support of M107, M110 and M578 tracked vehicles. Army San Francisco Procurement Agency, Oakland, Calif. DA-AG05-70-C-0894.

30—The Army Engineer District, Mobile, Ala., issued the following contracts:

Burns, Kirkley and Williams Co., Inc., Auburn, Ala. $1,123,461. Construction of an instrument trainer building with support utilities, Fort Rucker, Ala. DA-CA01-70-C-0064.

Chemical Construction Co., New York, N.Y. $2,250,000. Design and construction of a nitric acid concentrator and related air pollution control facilities, Army Ammunition Plant, Radford, Va. DA-CA01-70-C-0062.

Hoechst-Uhde Corp., Englewood, N.J. $7,766,000. Design and construction of a nitric acid producing unit and associated air pollution control facilities, Army Ammunition Plant, Joliet, Ill. DA-CA01-70-C-0058. $7,863,500. Nitric acid processing unit and air pollution control facilities, Volunteer Army Ammunition Plant, Chattanooga, Tenn. DA-CA01-70-C-0057.

—**Trammell Construction Co., Inc.**, Bristol, Tenn. $1,996,800. Expansion of the water treatment and distribution system, Fort Benning, Ga. Army Engineer District, Savannah, Ga. DA-CA21-70-C-0060.

—**Arundel Corp.** and **L. E. Dixon Co.** (joint venture), Baltimore, Md. $22,547,980. Construction of a dam and appurtenances, Hannibal Lock and Dam Project, Ohio River. Wetzel County, W.Va., and Monroe, Ohio. Army Engineer District, Pittsburgh, Pa. DA-CW59-70-C-0118.

—**Navigate, Inc.**, Clearwater, Fla. $1,152,000. Furnishing and installing an automatic storage and retrieval system for depot maintenance activities. Clearwater and Red River Army Depot, Texarkana, Tex. Red River Army Depot, Texarkana, Tex. DA-AG47-70-C-0110.

—**Allan Construction Co., Inc., and Bertling Construction Co.** (joint venture), San Antonio, Tex. $1,254,427. Construction of a 30,000-foot long levee on the east bank of the Brazos River-Freeport Hurricane Flood Protection Project, Brazoria County, Tex. Army Engineer District, Galveston, Tex. DA-CW64-70-C-0091.

—**Hamilton Construction Co.**, Trenton, N.J. $1,425,395. Construction of an electronic warfare lab, Fort Monmouth, N.J. Army Engineer District, New York, N.Y. DA-CA51-70-C-0094.

—**Browning Construction Co.**, San Antonio, Tex. $7,924,370. Construction of a three-story medical field service school, Brooke Army Medical Center, San Antonio. Army Engineer District, Fort Worth, Tex. DA-CA63-70-C-0081.

—**Dollar Excavating Co., Inc.**, St. Louis, Mo. $2,075,018. Phase II interior road construction, Stockton Reservoir—Sac River Project, Mo. Army Engineer District, Kansas City, Mo. DA-CW41-70-C-0111.

—**New Mexico State University**, Las Cruces, N.M. $2,115,537. Data reduction for analysis processing and computer operations. Las Cruces and White Sands Missile Range, N.M. Army Test and Evaluation Command, White Sands Missile Range, N.M. DA-AD07-70-C-0234.

—**Capital Dredge and Dock Corp.**, Lorain, Ohio. $2,168,880. Channel dredging and construction of breakwaters, Point Lookout Harbor, Arenac County, Mich. Army Engineer District, Detroit, Mich. DA-CW35-70-C-0058.

—The Army Engineer District, Chicago, Ill., issued the following contracts:

Cenco Piping Corp., General Energy Systems Corp., Jonesville, Wis. $20,928,000. Construction of TNT manufacturing facilities, including industrial buildings and equipment, product transfer piping, roads and railroad utility services, at the Army Ammunition Plant, Joliet, Ill. DA-CA23-70-C-0084.

Chemical Construction Co., New York, N.Y. $4,525,000. Erection and/or installation of a Government-furnished sulfuric acid regeneration plant, Army Ammunition Plant, Newport, Ind. DA-CA23-70-C-0083.

—The Army Engineer District, Jacksonville, Fla., issued the following contracts:

Atlantic Gulf and Pacific Co., **Bauer Dredging and Construction Co., Inc.**, and **Western Contracting Corp.** (joint venture), Bloomfield, N.J. $7,786,000. Channel dredging, Jacksonville Harbor Project, Fla. DA-CW17-70-C-0103.

Troup Brothers, Inc., Miami, Fla. $4,195,725. Construction of levees 62 and 63N, structures 192 and 193, and appurtenant work, Central and Southern Florida Project, Highland and Okeechobee Counties. DA-CW17-70-C-0101.

—The Army Tank Automotive Command, Warren, Mich., issued the following contracts:

Kaiser Jeep Corp., Toledo, Ohio. $8,394,113 (contract modification). 5-ton trucks, XM809 series. South Bend, Ind. DA-AE06-69-C-0009.

Kaiser Jeep Corp., Wayne, Mich. $8,365,267 (contract modification). 2½-ton trucks, M44 series. DA-AE06-70-C-0001.

Engineered Devices Inc., Agawam, Mass. $1,193,100. 100 class 530C fire trucks. DA-AE01-70-C-7988.

Caterpillar Tractor Co., Peoria, Ill. $3,910,165. Phase II advanced production engineer program for a series of very high output engines. Mossville, Ill. DA-AE07-70-C-4854.

Teledyne Industries, Inc., Muskegon, Mich. $1,380,000. Engineering support services for multi-fuel engines, LDS-427 and 465. DA-AE07-70-C-4859.

Rakco Creative Services, Inc., Royal Oak, Mich. $1,119,000. Off-site engineering services for technical data publication documentation covering production and out of production vehicles and related equipment. DA-AE07-69-D-0012.

White Engines, Inc., Canton, Ohio. $1,626,596. 2,298 engines in support of M151 ¼-ton utility trucks. DA-AE07-70-C-4862.

—The Defense Supply Service, Washington, D.C., issued the following contracts:

University of California, Berkeley, Calif. $1,734,486. Research program on the design of a reliable and secure computer system. DA-HC15-70-C-0274.

Rand Corp., Santa Monica, Calif. $4,299,525 (contract modification). Military science and technology research program. DA-HC15-67-C-0141. $1,980,000 (contract modification). Remote/rural security research program. DA-HC15-67-C-0142.

—**Fermont Division, Dynamics Corp. of America**, Bridgeport, Conn. $10,578,567. Design, test and fabrication of 60kw generator sets. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. DA-AK02-70-C-0596.

—The Safeguard System Command, Huntsville, Ala., issued the following contract modifications:

Control Data Corp., Minneapolis, Minn. $1,228,370. Preliminary ballistic missile defense equipment development for a data processing system. DA-HC60-70-C-0056.

Western Electric Co., New York, N.Y. $2,737,370. Documentation for the Safeguard Ballistic Missile Defense System. Martin-Marietta Corp., Orlando, Fla., McDonnell-Douglas Corp., Santa Monica, Calif., and other locations. DA-30-069-AMC-333. $5,786,000. Additional research and development on the Sprint and Spartan subsystems, and the perimeter acquisition radar for the Safeguard system. General Electric Co., Syracuse, N.Y., Martin Marietta Corp., Orlando, Fla., McDonnell-Douglas Corp., Santa Monica, Calif., and other subcontractors. DA-30-069-AMC-333.

—The Army Mobility Equipment Command, St. Louis, Mo., issued the following contracts:

American Marc Div., Eon Corp., Englewood, Calif. $1,507,752. 5kw generator sets, 60 hp. DA-AK01-69-C-8359.

Fab-Weld Corp., Simpson, Pa. $8,205,475. 7,000 military van cargo containers. Susquehanna and Simpson, Pa. DA-AK01-70-C-7696.

—The Frankford Arsenal, Philadelphia, Pa., issued the following contracts:

Olin Corp., New Haven, Conn. $2,413,740. 5.56mm ball cartridges, M193. DA-AA25-70-C-0344.

Electromagnetic Technology Corp., Montgomerville, Pa. $1,346,170. Repair, update and/or refurbish AN/VPS-2 radar sets and components. DA-AA25-70-A-0470.

—The Army Missile Command, Huntsville, Ala., isued the following contracts:

Martin Marietta Corp., Orlando, Fla. $1,011,003. Transitional training from P-1 to P-1A Pershing missile configuration for Federal Republic of Germany personnel. DA-AH01-70-C-1391.

AAI Corp., Cockeysville, Md. $2,583,726. Six AN/MPQ-T1 Nike Hercules simulators. DA-AH01-70-C-1315.

—**Bell Helicopter Co.**, Fort Worth, Tex. $11,-

371, 724. UH-1N helicopters. DA-AJ01-70-C-0205. $6,297,814 (contract modification). Incorporation of ECP-UH-1-H33 crashworthy fuel systems. DA-AJ01-69-C-0028. Army Aviation Systems Command, St. Louis, Mo.

—The Edgewood Arsenal, Md., issued the following contracts:

Thiokol Chemical Corp., Woodbine, Ga. $1,151,781. CD-1 riot control agent. DA-AA15-70-C-0509.

Mine Safety Appliances Co., Pittsburgh, Pa. $2,868,860. M-2 filter panel infant protectors. Esmond, R.I. DA-AA15-70-C-0330.

—The Army Electronics Command, Fort Monmouth, N.J., issued the following contracts:

Fairchild Space and Defense Systems Corp., Syosset, N.Y. $1,887,000. 50 modification kits for AN/GLQ-3 equipment. DA-AB07-70-C-0305.

Texas Instruments, Inc., Austin, Tex. $1,500,000. Classified research and development equipment.

Watkins-Johnson Co., Palo Alto, Calif. $1,500,000. Classified research and development equipment.

Massachusetts Institute of Technology, Cambridge, Mass. $1,008,000 (contract modification). Basic and applied research in general physics, plasma, dynamics and communications flow sciences. DA-28-043-AMC-02536(E).

Honeywell, Inc., Tampa, Fla. $1,500,000. Classified electronic equipment.

TRW Colorado Electronics, Inc., Colorado Springs, Colo. $2,500,000. Classified electronic equipment.

Honeywell, Inc., St. Petersburg, Fla. $1,500,000 (contract modification). Classified electronic equipment. St. Petersburg and Tampa, Fla.

IBM Corp., Owego, N.Y. $8,500,000 (contract modification). Classified electronic equipment.

Collins Radio Co., Cedar Rapids, Iowa. $1,011,042. Components for AN/ARN-82 radio receiver sets. DA-AB07-70-C-0265.

Sperry Rand Corp., Phoenix, Ariz. $1,397,977. ID998 directional indicators and AM3209 amplifiers. DA-AB07-70-C-0328.

Burroughs Corp., Paoli, Pa. $1,115,000. Technical manuals for Automatic Message Processing System (AMPS) equipment. DA-AB07-70-C-0274.

General Dynamics Corp., San Diego, Calif. $1,283,766. 18-month study for the design of an Alerting Long Range Airborne Radar. DA-AB07-70-C-0341.

RCA, Burlington, Mass. $1,500,000. Integrated observation system (laser). DA-AB07-70-C-0340.

—**Maremont Corp.**, Saco, Maine. $7,814,506. 7.62mm machine guns, M60 series. Army Weapons Command, Rock Island, Ill. DA-AF03-70-C-0085.

—The Army Ammunition Procurement and Supply Agency, Joliet, Ill., awarded the following contracts:

Kennedy Van Saun Corp., Danville, Pa. $1,385,100 (contract modification). Metal parts for 105mm M489 TP-T projectile. DA-AA-09-70-C-00.

Chamberlain Manufacturing Co., Elmhurst, Ill. $7,532,147 (contract modification). Metal parts for facilities to support production of 155mm and 175mm projectiles. Scranton Army Ammunition Plant, Pa. DA-36-034-AMC-0163(A).

Olin Corp., Stamford, Conn. $10,122,561 (contract modification). Operation and maintenance of government-owned facility for production of propellants at Badger Army Ammunition Plant, Baraboo, Wis. DA-AA-09-69-C-0014.

Chamberlain Manufacturing Co., Waterloo, Iowa. $1,705,887. Metal parts for 105mm, smoke, WP, M60 projectile. DA-AA-09-70-C-0437.

Day and Zimmerman, Inc., Philadelphia, Pa. $1,788,381 (contract modification). Operation and maintenance of government-owned facility for ammunition components at Kansas Army Ammunition Plant, Parsons, Kan. DA-AA-09-70-C-0245.

Atlas Chemical Industries, Inc., Wilmington, Del. $7,921,828 (contract modification). Operation and maintenance of government-owned facility for production of explosives at Volunteer Army Ammunition Plant, Chatanooga, Tenn. DA-11-173-AMC-531.

Harvey Aluminum Sales, Inc., Torrance, Calif. $3,299,820 (contract modification). Operation and maintenance of government-owned facility for loading, assembling and packing of ammunition. Army Ammunition Plant, Milan, Tenn. DA-11-173-AMC-520(A).

Hercules, Inc., Wilmington, Del. $3,021,990 (contract modification). Operation and maintenance of government-owned facilities for manufacture of rocket propellant at Sunflower Army Ammunition Plant, Lawrence, Kan. DA-11-173-AMC-72(A).

Day and Zimmerman, Inc., Philadelphia, Pa. $15,640,362 (contract modification). Operation and maintenance of government-owned facility and loading, assembling and packing of ammunition at Lone Star Army Ammunition Plant, Texarkana, Tex. DA-11-173-AMC-114A.

Uniroyal, Inc., New York, N. Y. $6,040,790 (contract modification). Operation and maintenance of government-owned facility for production of explosives, and loading, assembling and packing ammunition at Joliet Army Ammunition Plant, Joliet, Ill. DA-11-173-AMC-62(A).

Mason and Hanger-Silas Mason Co., Inc., Lexington, Ky. $3,463,288 (contract modification). Operation and maintenance of government-owned facility, and loading, assembling and packing ammunition at Cornhusker Army Ammunition Plant, Grand Island, Neb. DA-AA09-68-C-0383.

Remington Arms, Inc., Bridgeport, Conn. $17,487,044 (contract modification). Operation and maintenance of government-owned facility for manufacture of small arms ammunition at Lake City Army Ammunition Plant, Independence, Mo. DA-49-010-AMC-3A.

Eastman Kodak Co., Holston Defense Corp., Kingsport, Tenn. $11,727,495 (contract modification). Operation and maintenance of government-owned facility for manufacture of explosives at Holston Army Ammunition Plant, Kingsport, Tenn. DA-11-173-AMC-35A.

Sperry Rand Corp., New York, N.Y. $11,192,135 (contract modification). Operation and maintenance of government-owned facility, and loading, assembling and packing ammunition at Louisiana Army Ammunition Plant, Shreveport, La. DA-11-173-AMC-80A.

Federal Cartridge Corp., Minneapolis, Minn. $1,229,730 (contract modification). Operation of government-owned facility for production of small arms ammunition at Twin Cities Army Ammunition Plant, New Brighton, Minn. DA-36-038-AMC-01099(A).

Mason and Hanger-Silas Mason Co., Inc., Lexington, Ky $4,546,384 (contract modification). Operation and maintenance of government-owned facility, and loading, assembling and packing ammunition at Iowa Army Ammunition Plant, Burlington, Iowa. DA-AA-09-68-C-0468.

Hercules, Inc., Wilmington, Del. $9,339,321 (contract modification). Operation and maintenance of government-owned facility for production of explosives and propellants at Radford Army Ammunition Plant, Radford, Va. DA-11-173-AMC-37(A).

Olin Corp., Stamford, Conn. $5,269,674 (contract modification). Operation and maintenance of government owned facility for production of propellant charges at Indiana Army Ammunition Plant, Charlestown, Ind. DA-AA-09-69-C-0148.

DEPARTMENT OF THE NAVY

1—**Raytheon Co.**, Sudbury, Mass. $43,326,270. Poseidon guidance system electronic assemblies and components. Waltham, Mass. Naval Strategic Systems Project Office, Washington, D.C. N00030-70-C-0055.

—**E. E. Black Ltd.**, Honolulu, Hawaii. $6,942,600. Sewage system improvements and sewage collection and treatment facilities, Public Works Center, Pearl Harbor, Hawaii. Naval Facilities Engineering Command, Washington, D.C. N62471-69-C-0469.

—**General Dynamics Corp.**, Pomona, Calif. $6,487,750. Modification and update of Standard ARM missiles for the Air Force. Naval Air Systems Command, Washington, D.C. N00019-70-C-0529.

—**Dyson Construction Co.**, Pensacola, Fla. $2,212,793. Stock receiving facility, Naval Construction Battalion Center, Gulfport, Miss. Naval Facilities Engineering Command, Washington, D.C. N62468-70-C-0044.

2—The Naval Air Systems Command, Washington, D.C., issued the following contracts:

Pratt and Whitney Div., United Aircraft Corp., E. Hartford, Conn. $20,247,968 (contract modification). TF-30-P-100 engines for the Air Force. N00019-70-C-0208.

Gruman Aerospace Corp., Bethpage, N.Y. $23,000,000 (contract modification). Long lead time items for the EA-6B aircraft program. N00019-67-C-0078.

—**Johns Hopkins University**, Silver Spring, Md. $3,704,800. Increase level of effort for advanced research on the surface missile system. Naval Ordnance Systems Command, Washington, D.C. N00017-62-C-0604.

3—**FMC Corp.**, San Jose, Calif. $3,165,970. 942 assault amphibious landing craft, LVTP-7. Naval Ship Systems Command, Washington, D.C. N00024-70-C-0281.

4—**Raytheon Corp.**, Wayland, Mass. $1,647,906. Installment funding for classified system engineering and weapon system design. Naval Ordnance Systems Command, Washington, D.C. N00017-70-C-4409.

5—**Logicon, Inc.**, San Pedro, Calif. $1,642,690. Computer programs and parts of computer programs for TACDEW and WARS. Fleet Computer Programming Center, San Diego, Calif. Naval Purchasing Office, Los Angeles, Calif. N00123-70-C-1468.

8—**Sperry Rand Corp.**, Syossett, N.Y. $10,670-000. Five prototype inertial navigation subsystem phase-shift units, spares and associated studies for the C-3 Poseidon missile conversion program. Naval Ship Systems Command, Washington, D.C. N00024-70-C-5468.

—**Honeywell, Inc.**, Hopkins, Minn. $3,721,735 (contract modification). Mk 46 Mod 1 torpedoes. Naval Ordnance Systems Command, Washington, D.C. N00017-67-C-1102.

—**McDonnell Douglas Corp.**, Long Beach, Calif. $2,512,000 (contract modification). Long lead time items for the TA-4J aircraft program. Naval Air Systems Command, Washington, D.C. N00019-67-C-0170.

9—**Gall and Landau Construction Co., Braund Inc.**, and **SS Contractors Inc.** (joint venture), Seattle, Wash. $3,444,500. 200 family housing units, Naval Shipyard, Bremerton, Wash. Naval Facilities Engineering Command, Washington, D.C. N62476-70-C-0052.

10—**Fontaine Brothers**, Springfield, Mass. $2,107,000. Temporary lodging facilities, Naval Base, Newport, R.I., and Naval Submarine Base, New London, Conn. East Central Division, Naval Facilities Engineering Command, Philadelphia, Pa. N62472-70-C-0094.

—The following contracts were awarded by the Naval Ship Systems Command, Washington, D.C.:

General Electric Co., Schenectady, N.Y. $4,440,000 (contract modification). Nuclear reactor compartment components. N00024-69-C-5154.

B. F. Goodrich Rubber Co., Akron, Ohio. $1,875,967. Six sonar Domes. N00024-70-C-1345.

11—**Collins Radio Co.**, Cedar Rapids, Iowa. $7,046,793. Communication, navigation and identification components for AN/ASQ-19B/56B/57B and 88B sets. Naval Air Systems Command, Washington, D.C. N00019-70-C-0475.

—The Naval Ordnance Systems Command, Washington, D.C., issued the following contracts:

Vitro Laboratories, Silver Spring, Md. $1,176,000. Increased level of effort for systems engineering and supporting services for the Surface Missile System Project. N00017–70–C–4417.

General Motors Corp., Milwaukee, Wis. $1,300,000. Warhead exploder assemblies for Mk 48 Mod 1 torpedoes, and associated equipment. N00017–70–C–1213.

12—**Manpower, Inc.,** Milwaukee, Wis. $1,521,924. Mess attendant and food handling services for FY 1971, Naval Training Center, Great Lakes, Ill. Naval Administrative Command, Great Lakes, Ill. N00128–71–C–0001.

15—Sperry **Rand Corp.,** Great Neck, N.Y. $1,050,000. 16 radar shelters and supporting data. Hq., Marine Corps, Washington, D.C. M00027–70–C–0147.

16—**General Dynamics Corp.,** Pomona, Calif. $5,628,000 (contract modification). Standard ARM missiles and associated equipment for the Navy and Air Force. Pomona and Sycamore, Calif. Naval Air Systems Command, Washington, D.C. N00019–69–C–0336.

—**Hunt Building Marts Inc.,** El Paso, Tex. $1,933,072. Construction of 100 family housing units, Marine Corps Air Station, Yuma, Ariz. Naval Facilities Engineering Command, Washington, D.C. N62473–69–C–0125.

17—**Raytheon Co.,** Portsmouth, R.I. $9,172,535. Assembly and testing of nine AN/BQS–11/12 detecting and ranging sonar sets. Naval Ship Systems Command, Washington, D.C. N00024–70–C–1325.

18—**North American Rockwell Corp.,** Columbus, Ohio. $8,700,000 (contract modification). Parts and material for the RA–5C aircraft. Naval Air Systems Command, Washington, D.C. N00019–68–C–0190.

—**Peterson Boatbuilding Co.,** Tacoma, Wash. $1,932,368. Four wood-hulled patrol craft (YP). Naval Ship Systems Command, Washington, D.C. N00024–70–C–0302.

—**Woerfel Corp.,** Milwaukee, Wis. $5,992,995. Construction of an Omega Navigation station, La Moure, N.D. Chesapeake, Division, Naval Facilities Engineering Command, Washington, D.C. N62477–69–C–0095.

19—**Peterson Builders, Inc.,** Sturgeon Bay, Wis. $5,562,855. Seven steel-hulled harbor tugs, YTB. Naval Ship Systems Command, Washington, D.C. N00024–70–C–0301.

—**Woods Hole Oceanographic Institution,** Woods Hole, Mass. $1,895,199. Research in physical oceanography, marine geodesy, chemical oceanography, marine geology and geophysics, and instrumentation development. Office of Naval Research, Washington, D.C.

—The Navy Aviation Supply Office, Philadelphia, Pa., issued the following contracts for EA–6B/A–6E aircraft:

Fairchild Camera and Instrument Corp., Syosset, N.Y. $1,725,700. AN/ALQ–99 and AN/ASI–33 aircraft countermeasure equipment components and spare parts. N00383–70–C–5031.

General Instruments Corp., Hicksville, N.Y. $1,090,000. ALR–42 countermeasure system component equipment. N00383–70–C–4566.

Airborne Instrument Laboratories, Cutler-Hammer Corp., Deer Park, N.Y. $2,260,000. ALQ–99 countermeasure system component equipment. N00383–70–C–4565.

23—**Kollsman Instrument Corp.,** Syosset, N.Y. $3,865,890. Advanced development model of a hydrographic survey and charting system. Naval Oceanographic Office, Washington, D.C. N62306–70–C–0159.

—**Aluminum Co. of America,** Pittsburgh, Pa. $2,098,878. Aluminum powder. Rockdale, Tex. Naval Ships Parts Control Center, Mechanicsburg, Pa. N00104–70–C–A155.

—**Systems Associates Inc.,** Long Beach, Calif. $1,256,617. Carrier aircraft support study. Naval Air Engineering Center, Philadelphia, Pa. N00156–70–C–2013.

25—**FMC Corp.,** Minneapolis, Minn. $21,041,433. Fabricate, test and prepare for shipment Mk 26 Mod 0 and Mod 1 guided missile launching systems. Fridley, Minn. Naval Ordnance Systems Command, Washington, D.C. N00017–70–C–2209.

—**Norden Div., United Aircraft Corp.,** Norwalk, Conn. $3,022,857. Long lead time items for use as initial spares for AN/APQ radar systems for A–6E aircraft. Navy Aviation Supply Office, Philadelphia, Pa. N00383–70–A–0503–0101.

—**Dynamics Enterprises Inc.,** Dunn, N.C. $1,499,040. Labor and materials to perform mess attendant services, Pearl Harbor, for FY 1971–1973. Naval Supply Center, Pearl Harbor, Hawaii. N00604–70–C–0508.

—**Johns Hopkins University,** Silver Spring, Md. $1,301,617 (contract modification). Research on the Surface Missile System. Naval Ordnance Systems Command, Washington, D.C. N00017–62–C–0604.

—**Regent Jack Manufacturing Co.,** Downey, Calif. $1,101,703. Aircraft jet engine installation and removal trailers. Naval Aviation Supply Office, Philadelphia, Pa. N00383–70–C–5618.

—**Rohr Corp.,** Chula Vista, Calif. $1,375,535. Automated parts retrieval and storage systems for helicopters. Corpus Christi, Tex., and Chula Vista. Naval Air Station, Corpus Christi, Tex. N00216–70–C–0271.

26—**Newport News Shipbuilding and Dry Dock Co.,** Newport News, Va. $61,970,523 (contract modification). Refueling, overhaul and alterations to the USS Enterprise, CVAN–65. N00024–68–C–0293. $3,448,610. Advance planning, design work and long lead time material procurement preparatory to the overhaul and C–3 Poseidon conversion of the USS Simon Bolivar, SSBN–641. N00024–70–C–0262. $2,474,846. Work preparatory to the overhaul and C–3 Poseidon conversion of the USS James K. Polk, SSBN–645. N00024–70–C–0263. Naval Ship Systems Command, Washington, D.C.

—The Naval Ordnance Systems Command, Washington, D.C., issued the following contracts:

General Dynamics Corp., Pomona, Calif. $11,418,571. Long lead time items for Standard missiles. N00017–67–C–2107.

Sperry **Rand Corp.,** Great Neck, N.Y. $1,683,600. Long lead time items for Terrier modernization program for DLG–20 and DLG–23 fire control systems, Mk 76 Mod 5. N00017–70–C–2315.

—**Motorola Inc.,** Scottsdale, Ariz. $1,374,513. Product improvement program for the EX45 target detecting device. Navy Purchasing Office, Los Angeles, Calif. N00123–70–C–1410.

—**HITCO, Inc.,** Gardena, Calif. $1,199,542. Classified submarine equipment. Naval Ship Systems Command, Washington, D.C. N00024–70–C–5545.

29—**Raytheon Co.,** Lexington, Mass. $16,322,387 (contract modification). Guidance and control units for Sparrow missiles for the Navy and Air Force. Lowell and Bedford, Mass., Bristol, Tenn., and Oxnard, Calif. Naval Air Systems Command, Washington, D.C. N00019–69–C–0358.

—**Demetree Builders Inc.,** Jacksonville, Fla. $1,984,915. Construction of a domestic and industrial waste facility, Naval Air Station, Jacksonville. Naval Facilities Engineering Command, Washington, D.C. N62467–68–C–0203.

—**DeLaval Turbine Corp.,** Trenton, N.J. $2,900,000. Fuel oil pumps, associated equipment and data for the Navy Standard Distillate Fuel Program. Naval Ship Systems Command, Washington, D.C. N00024–70–C–5497.

—**Bunker-Ramo Corp.,** Silver Spring, Md. $7,361,100. Spare components for the AN/ALQ–86 electronic countermeasures system for EA–6A aircraft. Canoga Park, Calif., and Silver Spring. Naval Air Systems Command, Washington, D.C. N00019–70–C–0587.

—**Johns Hopkins University,** Silver Spring, Md. $3,185,000 (contract modification). Increase the level of advanced research on the Surface Missile System. Naval Ordnance Systems Command, Washington, D.C. N00017–62–C–0604.

—**Wickes Industries,** Camden, N.J. $2,347,045. Air transportable air traffic control systems, AN/TSA–28A. Navy Purchasing Office, Los Angeles, Calif. N00123–70–C–0977.

30—The Naval Air Systems Command, Washington, D.C., issued the following contracts:

Bendix Corp., North Hollywood, Calif. $3,949,724. Sonar system components. N00019–70–C–0494.

Hughes Aircraft Co., Culver City, Calif. $4,000,000 (contract modification). Phoenix missile system program. Culver City, Los Angeles, El Segundo, Canoga Park, Calif., and Tucson, Ariz. N00019–69–C–0633.

Westinghouse Electric Corp., Baltimore, Md. $7,979,783 (contract modification). AN/APG–59 radar sets. N00019–70–C–0127.

Motorola, Inc., Scottsdale, Ariz. $3,135,000. Automatic Carrier Landing System beacon augmentor components. N00019–70–C–0565.

Honeywell, Inc., Minneapolis, Minn. $13,386,262 (contract modification). Rockeye II weapon system. N00019–70–C–0140.

—The following contracts were awarded by the Naval Ship Systems Command, Washington, D.C.:

Philco-Ford Corp., Willow Grove, Pa. $1,310,680. Computer card punch machines. N00024–70–C–1310.

Newport News Shipbuilding and Dry Dock Co., Newport News, Va. $24,887,614 (contract modification). Preparation for, and overhaul, refueling and C–3 conversion of the USS Daniel Boone, SSBN–629. N00024–68–C–0260 PZ09. $24,721,520 (contract modification). Preparation for, and overhaul, refueling and C–3 conversion of the USS Tecumseh, SSBN–628. N00024–69–C–0215 PZ10.

Harbor Boat Building Co., Terminal Island, Calif. $9,139,051. Modernization and repair of five ocean minesweepers (MSOs). N0024–70–C–0309.

Sperry Gyroscope Div., Sperry Rand Corp., New York, N.Y. $2,377,000. Ships Inertial Navigation System (SINS), repair parts and associated technical data. Great Neck, N.Y. N00024–70–C–5594.

—The Naval Ordnance Systems Command, Washington, D.C., issued the following contracts:

Singer-General Precision, Inc., Glendale, Calif. $1,544,193. Ordnance alteration kits for Mk 101, 112 and 113/7 Fire Control System, in support of the Mk 48 torpedo program. N00017–70–C–1215.

General Dynamics Corp., Pomona, Calif. $1,206,000. Test equipment for the standard missile depot and level maintenance facility. N00017–70–C–0177.

—**Interstate Electronics Corp.,** Anaheim, Calif. $1,939,500. Poseidon missile test instrumentation equipment. Naval Strategic Systems Project Office, Washington, D.C. N00030–70–C–0177.

—**Hughes Aircraft Co.,** Fullerton, Calif. $4,203,681. Design and installation of a Marine Corps tactical air command and control test facility, Camp Pendleton, Calif. Naval Electronic Systems Command, Washington, D.C. N00039–70–C–3552.

DEPARTMENT OF THE AIR FORCE

1—**Lockheed Aircraft Corp.,** Marietta, Ga. $14,004,200. C–5A aircraft spare parts. Detachment 31, San Antonio Air Materiel Area, Marietta, Ga. AF33(657)15053.

—**General Motors Corp.,** Indianapolis, Ind. $21,233,510. TF–41–A–1 turbofan engines. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657–67–C–0163–P105.

—**General Dynamics Corp.,** Fort Worth, Tex. $1,099,385. Modification of electronic warfare evaluation simulators. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33615–70–C–1507.

2—The Space and Missile Systems Organization, AFSC, Los Angeles, Calif., issued the following contracts:

General Electric Co., Philadelphia, Pa. $3,900,000. Research and development of a Mk 12 reentry vehicle. AF 04(694)-975.

Raytheon Service Co., Burlington, Mass. $1,695,650. Improvement in radar equipment used in support of the Advanced Ballistic Reentry System (ABRES). F04701-69-C-0238.

3—**General Electric Co.**, Philadelphia, Pa. $10,775,702. Research and development of the Mk 12 reentry system. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. AF04(694)-731.

—The Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio, issued the following contracts:

Lockheed Aircraft Co., Marietta, Ga. $2,733,141. C-5A aircraft aerospace ground equipment. AF33(657)-15053.

General Electric Co., West Lynn, Mass. $1,000,000. Aircraft engine component improvements. F33657-70-C-0545.

4—**North American Rockwell Corp.**, Anaheim, Calif. $4,674,563. Design, development and fabrication of depot maintenance ground equipment, factory tooling, and test equipment in support of guidance and control systems for Minuteman III missiles. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701-69-C-0129.

—**Itek Corp.**, Palo Alto, Calif. $2,579,777. Aircraft radar component parts. Warner Robins Air Materiel Area, AFLC, Robins AFB, Ga. F04606-70-A-0021-RJ09.

5—**Westinghouse Electric Corp.**, Baltimore, Md. $6,156,000. Design and development of tactical air defense systems and related ground equipment. Electronic Systems Division, AFSC, L. G. Hanscom Field, Mass. F19628-70-C-0186.

—**North American Rockwell Corp.**, Anaheim, Calif. $10,813,298. Design and development of a post boost control system for Minuteman III. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701-68-C-0162.

8—**General Dynamics Corp.**, Fort Worth, Tex. $50,000,000. F-111 series aircraft aerospace ground equipment. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. AF33(657)13403.

—**Reading Techmatic Corp.**, Reading, Pa. $3,848,000. De-icing and decontamination spray units and spare parts. San Antonio Air Materiel Area, AFLC, Kelly AFB, Tex. F41608-70-D-7670.

10—**North American Rockwell Corp.**, Canoga Park, Calif. $1,000,000. Atlas MA-5 propulsion systems. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701-70-C-0248.

11—The Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio, issued the following contracts:

Lockheed Aircraft Corp., Marietta, Ga. $1,445,000. Building maintenance at Air Force Plant no. 6, Marietta. F33657-69-C-0727.

General Motors Corp., Indianapolis, Ind. $5,012,542. Improvement of T-56 turboprop engine components. F33657-70-C-0712.

Tec Data, Inc., Ventura, Calif. $1,559,628. Base maintenance services, Los Angeles Air Force Station. F04693-70-C-0029.

12—**Lockheed Aircraft Corp.**, Sunnyvale, Calif. $1,452,114. Research and development on the Air Force Satellite Control Facility, Sunnyvale. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701-70-C-0068.

—**Lockheed Aircraft Corp.**, Marietta, Ga. $4,848,880. Spare parts for C-5A aircraft. San Antonio Air Materiel Area, AFLC, Kelly AFB, Tex. AF33(657)-15053.

—**General Dynamics Corp.**, Fort Worth, Tex. $126,971,000. Adjustment of billing prices and increase in liquidation rate. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. AF33(657)-13403.

—**The Boeing Co.**, Seattle, Wash. $5,415,870. Force modernization of Engineering Test Facilities I and II, Hill AFB, Utah. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701-70-C-0140.

15—**Allen M. Campbell Co., General Contractors, Inc.**, Tyler, Tex. $5,119,000. Site development and construction of 300 family housing units, Eglin AFB, Fla. Procurement Division, Eglin AFB, Fla. F08651-70-C-0420.

16—**Hallicrafters Co.**, Rolling Meadows, Ill. $1,008,500. QRC-128A(T) electronic countermeasure equipment. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657-70-C-0944.

—**Hughes Aircraft Co.**, Fullerton, Calif. $2,250,000. Development of computer equipment for use in a tactical data system. Electronic Systems Division, AFSC, L. G. Hanscom Field, Mass. F19628-70-C-0189.

—**Westinghouse Electric Corp.**, Cockeysville, Md. $1,629,000. Radar test equipment. Ogden Air Materiel Area, AFLC, Hill AFB, Utah. F34601-70-A-0705QP26.

17—**Burroughs Corp.**, Washington, D.C. $1,026,910. Electronic data processing equipment. Pasadena, Calif. Procurement Division, Wright-Patterson AFB, Ohio. F33600-70-F-7242.

18—**Lockheed Aircraft Corp.**, Marietta, Ga. $50,000,000. C-5A development. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. AF33(657)-15053.

—**The Boeing Co.**, Seattle, Wash. $2,000,000. Design, development, study and test programs for Minuteman missiles. Space and Missiles Systems Organization, AFSC, Los Angeles, Calif. F04701-69-C-0153.

19—**Cessna Aircraft Co.**, Wichita, Kans. $1,177,000. A-37B aircraft spare parts and aerospace ground equipment. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657-67-C-0824.

—**General Motors Corp.**, Indianapolis, Ind. $6,604,680. T-56-A-7B turboprop engines, spare parts, aerospace ground equipment, modification kits and data. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657-70-C-0500.

22—**General Electric Co.**, Philadelphia, Pa. $2,000,000. Research and development of the Mk 12 reentry vehicle. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. AF 04-694-975.

23—**Philco-Ford Corp.**, Palo Alto, Calif. $4,432,812. Engineering support for the Air Force Satellite Control Facility Network. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701-70-C-0029.

24—**Lockheed Aircraft Corp.**, Marietta, Ga. $4,908,962. Spare parts for C-5A aircraft. Detachment 31, San Antonio Air Materiel Area, AFLC, Marietta, Ga. AF33(657)-15053.

—**General Electric Co.**, Philadelphia, Pa. $1,999,678. Research and development on the Mk 12 reentry system. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. AF04(694)-916.

25—**American Electric, Inc.**, La Mirada, Calif. $3,947,930. Air munitions. Ogden Air Materiel Area, AFLC, Hill AFB, Utah. F42600-70-C-728.

26—**General Electric Co.**, Cincinnati, Ohio. $1,571,148. Spare parts for TF-39 engines for the C-5A. San Antonio Air Materiel Area, AFLC, Kelly AFB, Tex. AF33(657)-15003.

—**Raytheon Co.**, Burlington, Mass. $3,120,220. Operation and maintenance of 440L over-the-horizon-radar sites. Electronic Systems Division, AFSC, L. G. Hanscom Field, Mass. F19628-70-C-0203.

—**Koppers Co., Inc.**, Baltimore, Md. $2,137,470. Noise suppression equipment for use in ground testing aircraft engines. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657-70-C-1154.

—The Oklahoma City Air Materiel Area, AFLC, Tinker AFB, Okla., issued the following contracts for field team services for the maintenance/modification of various weapon systems at world-wide Government installations:

Qualitron Aero, Inc., Fort Worth, Tex. $1,000,000. F34601-70-D-3562.

Dynalectron Corp., Fort Worth, Tex. $1,000,000. F34601-70-D-3563.

Lear Siegler, Inc., Oklahoma City, Okla. $1,000,000. F34601-70-D-3574.

29—The following contracts were awarded by the Space and Missile Systems Organization, AFSC, Los Angeles, Calif.:

United Technology Center, Div. of United Aircraft Corp., Sunnyvale, Calif. $12,947,307. Titan III C/D solid fuel rocket motors. F04695-67-C-0120.

Martin Marietta Corp., Denver, Colo. $19,947,039. Design, development, fabrication and delivery of Titan IIIC space booster and associated aerospace ground equipment. F04701-70-C-0202.

Massachusets Institute of Technology, Cambridge, Mass. $5,500,000. Development of third generation inertial guidance equipment for missile systems. F04701-70-C-0276.

—The Aeronautical Systems Div., AFSC, Wright-Patterson AFB, Ohio, has issued the following contracts:

Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y. $1,019,700. Advanced development of command and control systems. F33615-70-C--1600.

General Dynamics Corp., Fort Worth, Tex. $6,683,999. Aerospace ground equipment for F-111D aircraft. AF33(657)-13403.

—The Oklahoma City Air Materiel Area, AFLC, Tinker AFB, Okla., has awarded the following contracts:

Hayes International Corp., Birmingham, Ala. $1,365,696. Inspection, repair and modification of KC-135 aircraft. F34601-68-C-3607.

Futuronics Corp., Port Washington, N.Y. $2,935,700. Mobile communications vans. F34601-70-C-3556.

—**Bendix Corp.**, Baltimore, Md. $2,290,000. Technical services to support equipment used in tracking space vehicles. Baltimore and Colorado Springs, Colo. Aerospace Defense Command, Colorado Springs, Colo. F05604-70-C-0010.

30—The Sacramento Air Materiel Area, AFLC, McClellan AFB, Calif., awarded the following contracts:

Lockheed Aircraft Service Co., Lockheed Aircraft Corp., Ontario, Calif. $14,920,000. Maintenance of F/TF-104G aircraft at Luke AFB, Ariz. F04707-71-C-0019.

Solar Div., **International Harvester Co.** $5,048,462. Turbine engine driven electrical power plants and generator sets. F04606-68-D-0643.

—**Radiation, Inc.**, Melbourne, Fla. $2,695,000. Electronic equipment. Palm Bay, Fla. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701-70-C-0251.

—**Communications Div., ITT**, Nutley, N.J. $1,370,000. Maintenance training and support of Air Force personnel for the Strategic Air Command automated command control system. Offutt, Barksdale and March AFBs and Nutley, N.J. Procurement Div., Offutt AFB, Neb. F25600-70-C-0400.

—**Concrete Pavers, Inc.**, Tampa, Fla. $1,380,025. Repair of runway at MacDill AFB, Fla. Procurement Div., MacDill AFB, Fla. F08602-70-C-0175.

—**Singer General Precision, Inc.**, Silver Spring, Md. $3,094,000. Modification kits and related data for flight simulators for KC-135 aircraft. Ogden Air Material Area, AFLC, Hill AFB, Utah. F42600-70-C-1359.

—**Sikorsky Aircraft Div., United Aircraft Corp.**, Stratford, Conn. $4,723,619. Modification kits for main rotor blades of H-3 series of helicopters. Warner Robins Air Materiel Area, AFLC, Robins AFB, Ga. N00019-70-A-0002.

—**Spillyard Machinery Co.**, San Antonio, Tex. $1,125,000. Furnishing and installation of a storage aid system in an existing building at Kelly AFB, Tex. San Antonio Air Materiel Area, AFLC, Kelly AFB, Tex. F41699-70-C-0747.

—**Carnegie-Mellon University**, Pittsburgh, Pa. $1,800,000. Research in information processing. Office of Scientific Research, Arlington, Va. F44620-70-C-0107.

—**Univac Federal Systems Div., Sperry Rand Corp.**, St. Paul, Minn. $1,500,000. Maintenance and rental of automatic data processing equipment. Carswell AFB, Tex. Air Force Communications Service, Scott AFB, Ill. F11628-69-C-0027.

—The Space and Missile Systems Organization, AFSC, Los Angeles, Calif., has awarded the following contracts:

Massachusetts Institute of Technology, Cambridge, Mass. $1,300,000. Advanced development of the Minuteman guidance system. AF04(694)-999.

Aerojet-General Corp., Sacramento, Calif. $4,473,209. Production of Titan IIIC third stage engines. F04701-68-C-0267.

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AVCO Corp., Greenwich, Conn. $2,475,888. Fabrication and testing of Mark 11C Minuteman reentry vehicle. Stratford, Conn. F04701–69–C–0242.

Aerojet-General Corp., Sacramento, Calif. $12,100,000. Titan III B/C/D Stage I and II liquid rocket engine systems. F04701–70–C–0095.

Silvania Electronic Systems, Waltham, Mass. $1,440,343. Services and supplies to support Minuteman ground electronics system. F04701–69–C–0229.

—**The Boeing Co.,** Seattle, Wash. $4,900,000. Long lead effort and data to support FY 1971 production buy of short range attack missile (SRAM). Aeronautical Systems Div., AFSC, Wright-Patterson AFB, Ohio. F33657–70–C–0876.

Air Force R & D

(*Continued from page 29*)

the Air Force. This research encompasses every scientific discipline that is relevant to the continued superiority of the Air Force operational capability. It is the mission of AFSC to manage this large and diverse program, not only to assure that research dollars are spent wisely, but also to disseminate the results of this research to government and non-government scientific communities. Therefore, AFSC has taken over OAR's Management and Scientific Information System (MASIS).

MASIS is a computer-based system which accumulates data on the many research efforts comprising the Air Force's research program. MASIS data is organized into four master files—proposal, fiscal, narrative, and publication—which correspond to the stages associated with the selection and performance of research.

Expansion of DOL

Before the merger, AFSC's Directorate of Laboratories (DOL), was structured with a director, deputy director, and four directorates to manage AFSC's nine laboratories and their diverse programs. The directorates were Laboratory Plans and Programs, Science and Technology, Technology Applications and Technical Liaison.

To adjust to the added responsibilities of furnishing guidance to the four new major laboratories gained in consolidation, and applying the laboratories' work to the needs of the Air Force, the Director of Laboratories now has two deputies, one for research and one for technology. The Deputy Director for Research, who has not been named at presstime, will be primarily concerned with the new basic research laboratories and the research activities of the others. The Deputy Director for Technology is Peter R. Murray, former AFSC Deputy Director of Laboratories. He will be primarily concerned with the nine AFSC laboratories in existence prior to the merger, and the technological aspects of the four new laboratories.

The previous Science and Technology Directorate of DOL has been renamed the Technology Directorate, and a new Directorate of Science has been created.

Brigadier General Raymond A. Gilbert, who has been AFSC's Director of Laboratories since April 1967, retired July 31. Major General Paul T. Cooper, AFSC's Chief of Staff since August 1968, will become Director of Laboratories upon General Gilbert's retirement.

Space Weather Forecasts Begin

The Air Force now has a space weather forecasting system in operation.

More than 50 ground-based stations all over the world transmit teletype data as a direct input to a system of four UNIVAC 1108 computers at the Air Force Global Weather Central at Offutt AFB, Neb. Satellite data is also a direct input to the system. The data consists of solar activity, solar emissions, and solar-induced geomagnetic and ionospheric changes in the earth's environment. The computer processes these data as a basis for forecasting changes in the earth's environment affecting Air Force communications, navigation, and surveillance systems.

The Air Weather Service and the Air Force Cambridge Research Laboratories together established uniform observing and reporting procedures and designed carefully calibrated instruments to provide standardized information. With this system, predictions of solar-terrestrial effects will be made with greater accuracy and for longer periods in advance, and it may prove of value in furthering knowledge of how specific solar variations translate into a specific set of terrestrial effects.

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DOD Establishes Office of Health and Environment

Secretary of Defense Melvin R. Laird has announced the establishment of the Office of Assistant Secretary of Defense for Health and Environment. Dr. Louis M. Rousselot, presently serving as Deputy Assistant Secretary of Defense (Manpower and Reserve Affairs) for Health Affairs, has been nominated by President Nixon for the new position.

The Assistant Secretary for Health and Environment will be the principal staff advisor and coordinator for the Secretary of Defense for health and sanitation matters throughout the Defense Department. This includes the care and treatment of patients, preventive medicine, clinical investigations, hospitals and related health facilities, medical material, and nutrition and health personnel, including their education, training and retention.

Responsibility for environmental quality matters, previously under the Office of the Assistant Secretary of Defense (Installations and Logistics) [OASD(I&L)], will be added to the functions of the new assistant secretary. These responsibilities will include coordination of defense matters regarding environmental quality with other appropriate agencies.

Also among the new secretary's functions will be recognition of environmental quality problems related to the development, production and use of new materials, and providing guidance to insure their abatement and control. The office will also consult with other government officials for planning new activities to ensure that the best available techniques and methods are used for the protection of the environment.

Responsibility for the Defense Department's Natural Resource Program, which includes development, protection and conservation of forest and other vegetative cover, and soil and water conservation programs on military installations, will remain with OASD(I&L). This includes projects for prevention, control and abatement of environmental pollution.

The new position was authorized by Public Law 91–121, signed Nov. 19, 1969. Policy guidance on pollution control at federal facilities was provided for in Executive Order 11507, issued Feb. 4, 1970.

Dr. Rousselot was a Professor of Clinical Surgery at New York University School of Medicine, and Director of Surgery at St. Vincent's Hospital and Medical Center, New York City, prior to his appointment to the Defense Department in January 1968.

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